US 301 MAINLINE TOLL ROAD
TRAFFIC AND REVENUE FORECAST

June 2012

FINAL

Prepared for The Delaware Department of Transportation

In association with:

Alliance Transportation Group

Stantec

US 301 MAINLINE TRAFFIC AND REVENUE (T&R) REPORT

JUNE 2012

ENCLOSED HEREIN IS THE NOVEMBER 4, 2011 DRAFT TRAFFIC AND REVENUE (T&R) REPORT PREPARED BY STANTEC FOR THE US 301 MAINLINE PROJECT. WHILE THE RESULTS FOUND IN THE REPORT HAVE NOT CHANGED SINCE THE DRAFT REPORT WAS PUBLISHED, ADDITIONAL REVIEWS HAVE OCCURRED TO CLARIFY THE INFORMATION AND ANALYSIS. APPENDIX B HAS BEEN ADDED TO THE DRAFT T&R REPORT AND RESPONDS TO THE FOLLOWING:

- COMMENTS RESULTING FROM AN INDEPENDENT REVIEW, BY FHWA, OF THE DRAFT T&R REPORT
- GRAPHIC THAT SHOWS BETTER CLARITY OF THE NATURE OF THE TRIPS ON US 301 AT THE MD/DE STATE LINE, AS SHOWN IN MORE DETAIL IN THE T&R REPORT

AS NOTED IN THE PAST, A T&R REPORT MUST BE UPDATED CLOSE TO THE TIME OF ANY POTENTIAL REVENUE BOND SALE. ADDITIONAL REQUIRED UPDATES OF THE US 301 MAINLINE T&R REPORT ARE EXPECTED.

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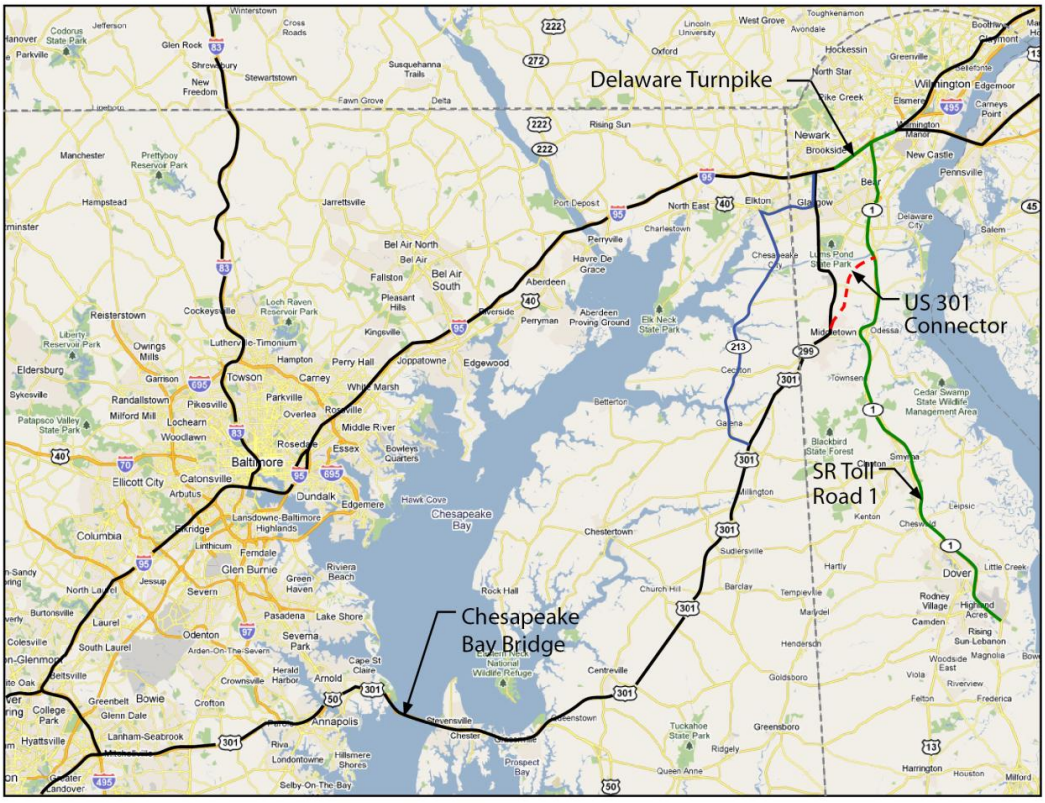
EXECUTIVE SUMMARY

The traffic and toll revenue forecasts for the proposed US 301 Mainline Toll Road have been prepared in connection with Delaware Department of Transportation's (DelDOT's) financing of the project. The purposes of the US 301 Mainline Toll Road, referred to as the "US 301 Project", are to reduce existing and projected roadway congestion, improve safety on the local arterial roadways and manage long-haul auto and truck traffic through the rapidly-growing area surrounding Middletown, Delaware. The proposed route is shown in Figure ES-1.

This report presents the estimates of the traffic and toll revenue for the project configuration based on the final approved alignment. The traffic and revenue estimates were developed using an enhanced version of the DelDOT Statewide Transportation Model as well as the latest version of the Stantec Toll Diversion Model. Forecasts were prepared for a 40-year horizon period consistent with the anticipated financing.

Figure ES-1
Principal Routes in the Delaware / Chesapeake Bay



ES.1 Project Description

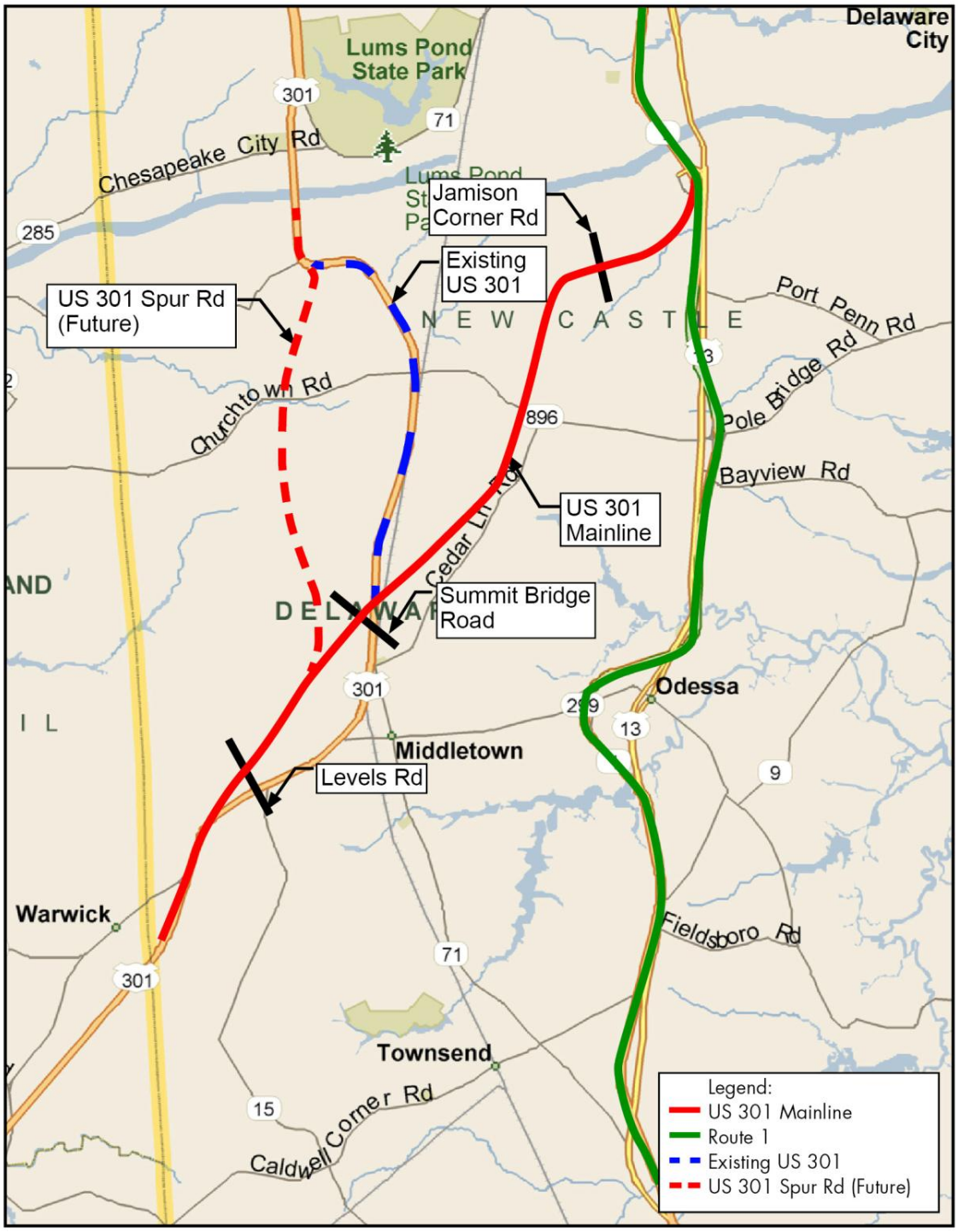
The US 301 Mainline Toll Road will improve travel along existing US 301 in the Northeast Corridor between Wilmington, Delaware and Washington, D.C. and provides an attractive alternative to traveling on the highly congested sections of I-95. US 301 in Maryland is a controlled-access roadway between the Chesapeake Bay Bridge and the Delaware state line, with limited at-grade intersections. The US 301 Mainline Toll Road will extend from a connection with the Maryland section of US 301 at the state line passing west of Middletown, and then northward and eastward, tying into SR 1 south of the Chesapeake & Delaware (C&D) Canal. Accordingly, US 301 Mainline Toll Road will be routed via SR 1 over the Canal Bridge and the present routing designation via SR 896 to US 40 will be removed.

The conceptual alignment for US 301 Toll Road is provided in Figure ES-2. Note that with the completion of the new toll road, the existing US 301 Alignment near Middletown would be a different state route designation which has not yet been determined. Traffic would be able to use the proposed Summit Bridge Road Interchange to access SR 896 to cross the C&D Canal via the Summit Bridge.

The new toll road will be constructed as a four-lane limited access roadway with a total length of approximately 14 miles. The new toll road will have interchanges at Levels Road, Summit Bridge Road (Existing US 301 Alignment) and Jamison Corner Road. For this analysis, it was assumed that the US 301 Mainline would be completed by July 2015.

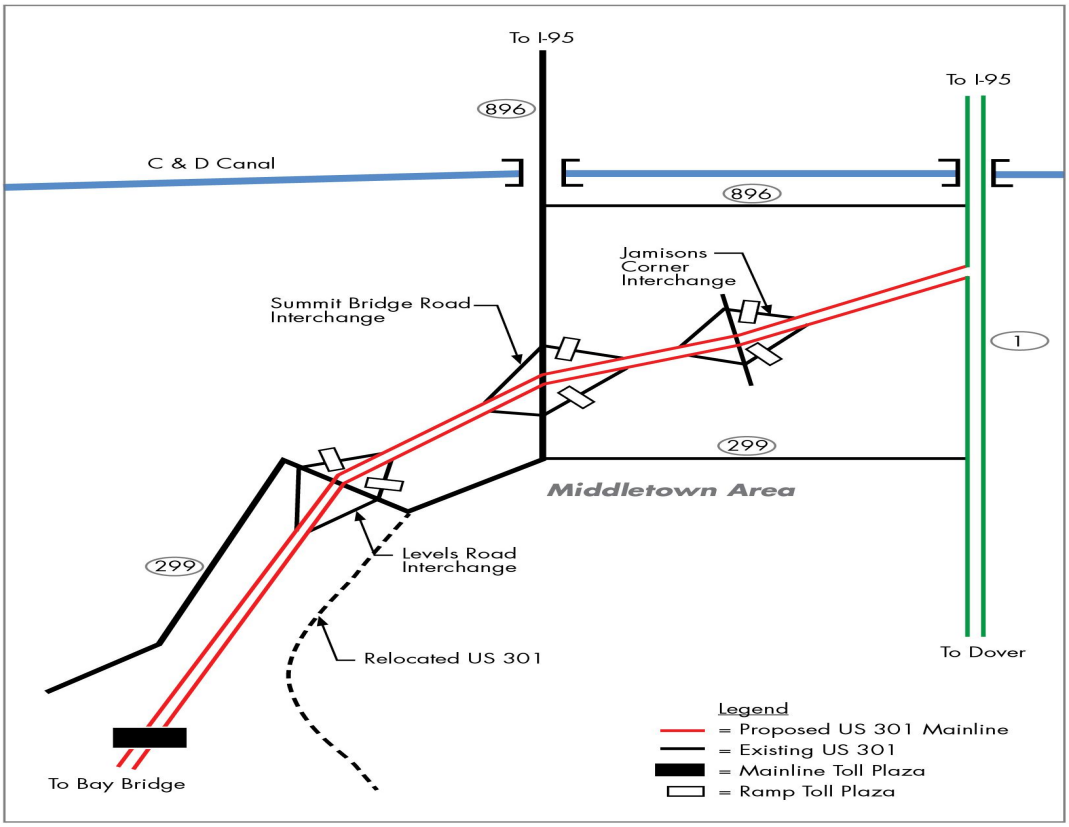
The US 301 Mainline Toll Road Project also includes a Spur Roadway as a future project that would provide a direct connection to SR 896 immediately south of the Summit Bridge. For this Traffic and Revenue Report, it is assumed that the US 301 Spur Road will be financed after the US 301 Mainline Toll Road is financed and that the US 301 Spur Road will not be constructed until after the US 301 Mainline Toll Road is opened to traffic.

Figure ES-2
US 301 Mainline Toll Road Alignment



As shown in the schematic in Figure ES-3, toll charges are assessed at a mainline barrier just east of the Maryland state line and at the ramps serving traffic to/from the north at the Levels Road, Summit Bridge Road, and Jamison Corner Road interchanges. The toll collection plan is designed as a “closed system” that requires all trips using the facility to pay a toll.

Figure ES-3
US 301 Mainline Toll Road



Toll charges will be paid either with cash or with transponders. Video recognition of vehicles will be used only as an enforcement mechanism. Cash transactions will be provided at all paypoints with manned booths at the mainline plaza and automated coin machines at the ramp plazas. Similar to the Delaware Turnpike and SR 1, toll rates for different vehicle types will be based on the number of axles.

The route designation of certain roadways will be altered and a series of truck restrictions will also be implemented to prohibit trucks from using local roads adjacent to the new toll road. Due to the planned truck restrictions, it is anticipated that most northbound trucks seeking a non-tolled alternative route will exit US 301 at the intersection with MD 313 in order to access MD 213 and US 40 via Elkton Maryland.

ES.2 Existing Travel Patterns

Traffic count, origin/destination survey data and travel time/speed survey data from existing sources and new field surveys for this study were used to develop travel patterns in the project area and to support the development and calibration of the travel demand model for this project.

Table ES-1 lists the traffic growth at permanent count stations on US 301 in Delaware and MD 213 from 2000 to 2010. While MD 213, as an existing 2-lane roadway, is not a significant competing route currently, it has the potential to be a competing non-tolled route, especially for trucks, when the US 301 Mainline Toll Road is completed.

Table ES-1
US 301/MD 213 Traffic Growth, 2000-2010

Year	US 301[(A)]		MD 213[(B)]	
	AADT	Change	AADT	Change
2000	12,188		9,894	
2001	12,675	4.0%	9,814	-0.8%
2002	14,399	13.6%	10,410	6.1%
2003	14,439	0.3%	10,409	0.0%
2004	14,613	1.2%	10,829	4.0%
2005	14,725	0.8%	10,784	-0.4%
2006	14,611	-0.8%	10,706	-0.7%
2007	15,552	6.4%	10,402	-2.8%
2008	15,581	0.2%	10,088	-3.0%
2009	14,259	-8.5%	9,022	-10.6%
2010	14,435	1.2%	8,260	-8.4%

Notes:
(A) North of Warwick Road (SR 299) Permanent ATR 8016
(B) Near MD 310 (Permanent ATR P0058) - South of C&D Canal

The average daily traffic (AADT) along US 301 has had an average annual growth of 1.7% between years 2000 to 2010; however, there were periodic upward spikes in several years. In 2007, the AADT increased considerably at a rate of 6.4 percent compared to traffic from previous year which could be attributed to traffic diverting from I-95 due to the toll increase at the I-95 Newark Toll Plaza that year. Significant growth from 2001 to 2002 could be attributed to the significant toll increase at the I-95 Kennedy Toll Plaza in 2001, in which both auto and truck (5-axle) rates were doubled, causing traffic diversion from I-95 to US 301. Traffic was reduced in 2009 by 8.5% due to both to the economic recession and construction along US 301 in Middletown.

DelDOT installed a new permanent count station on US 301 immediately adjacent to the state line in the vicinity where the proposed mainline plaza for the US 301 Mainline Toll Road would be located in July, 2008 and full year data for 2009 and 2010 are available. As shown in Table ES-2, the change in between 2009 and 2010 indicates a slight increase in traffic.

Table ES-2
US 301Traffic Growth, 2008-2010

Year	US 301[A]		US 301[B]	
	AADT	Change	AADT	Change
2008	15,581			
2009	14,259	-8.5%	10,838	
2010	14,435	1.2%	11,009	1.6%

Notes:
(A) North of Warwick Road (SR 299) Permanent ATR 8016
(B) North of MD state line near proposed mainline toll plaza

The new permanent count station at state line also provides classification counts and an estimate of the percentage of vehicles with transponders. Table ES-3 provides a summary of that data for 2008 through 2010. Trucks (all vehicles with 3 or more axles as well as 2-axle–6 tire vehicles) are approximately 22.0 percent of total traffic.

Table ES-3
US 301 Traffic Growth, 2008-2010

Year	Auto AADT		Truck AADT[A]		Percent Truck		Vehicle with ETC[B]	
	Volume	Change	Volume	Change	Percent	Change	Percent	Change
2008[C]	8,449		2,336		21.7%		40.0%	
2009	8,409	-0.5%	2,429	4.0%	22.4%	3.2%	39.5%	-1.3%
2010	8,547	1.6%	2,462	1.4%	22.4%	0.0%	39.0%	-1.3%

NOTES:
[A] Trucks include 2-axle, 6-tire vehicles
[B] Vehicles Equipped with Transponders
[C] 2008 data includes the period of July through December

The percentage of vehicles with transponders is approximately 40 percent and this value is largely unchanged since the new permanent count location was established in July, 2008. The slight reduction in transponder shares in 2010 could be related to a slightly lower share of long distance trips as a result of the 2008 recession.

Using the new permanent count station statistics at the state line, the number of trucks by axle category was estimated for 2009, as shown in Table ES-4.

Table ES-4
US 301 Traffic by Vehicle Class for 2009

Vehicle Class	Volume	Percent of	
		Total	Truck
2 axle 4-tire	8,409	77.6%	
2 axle 6-tire	550	5.1%	22.6%
3 axle	62	0.6%	2.6%
4 axle	145	1.3%	6.0%
5 axle	1,642	15.2%	67.6%
6 axle	30	0.3%	1.2%
Total	**10,838**	**100.0%**	**100.0%**

Note that approximately 67 percent of the truck volume is in the 5-axle category. These larger trucks are normally long-haul truck trips as confirmed by the origin-destination survey data.

Travel time and speed data were collected for various roadway segments both for local routes near the proposed mainline toll plaza as well as for long-haul routes serving longer distance travelers. These data were collected by RK&K and Stantec Staff in 2005, 2008, and 2010.

Table ES-5 provides a comparison of the travel times on the trips passing through the Middletown area on the US 301 Mainline Toll Road and the nearest non-tolled alternative route. A comparison of travel times and distances for a typical trip using the a non-tolled route following existing US 301 and the proposed US 301 Mainline Toll Road indicates an estimated distance savings of 4 miles and a time savings of 24 minutes for auto trips. For truck trips, the non-tolled alternative routing would use MD 213 which is 27 minutes more and 6 miles longer than the tolled path via the new via the new route.

For a long distance trip between the northerly decision point at I-95/SR 1 and the southerly decision point at I-95/I-495/US 50 along the Capital Beltway east of Washington, D.C., it is estimated that the US 301 Mainline project would likely reduce approximately 12 minutes off the present 117 minutes, and increase the US 301 average speed to 60 mph (matching that on I-95).

Table ES-5
Current and Projected Travel Times and Distances in the US 301 Corridor

Mode	Route End Points	Route	Distance (Miles)	Time[(A)] (Min.)	Speed (MPH)
Auto	SR-1/I-95 & US 301/MD 313	Via I-95, SR896, Existing US 301, SR 299 & MD 282	33	52	38
		Via SR 1 and Proposed US 301 Connector Toll Road	29	28	62
		Saving via US 301 Connector Toll Road	4	24	
Trucks	SR-1/I-95 & US 301/MD 313	Via I-95, SR 896, US 40, MD 213, & MD 313	35	55	38
		Via SR 1 and Proposed US 301 Connector Toll Road	29	28	62
		Saving via US 301 Connector Toll Road	6	27	

[(A)] Peak Period Times
For US 301 Connector Toll Road, used 2015 AM Peak Network

Roadside traffic surveys were conducted by RK&K in 2005 and in 2011 to identify the travel patterns of auto and truck traffic on existing US 301. The results of the 2011 survey were expanded to be representative of traffic patterns in the corridor on a typical weekday in the model calibration year (2009),

Table ES-6 provides a further disaggregation of the survey data by individual origin and destination districts. The states accounting for most of the trip origins are Maryland, followed by Virginia. For passenger cars, 81 percent of the trips were from Maryland: 67 percent of the trips had origins in the Eastern Shore counties and remaining 14 percent had origins on the west of the Chesapeake Bay and entered the area via the Bay Bridge. Another 4 percent began in Virginia. For trucks, the major portion of the trips also had origins in Maryland: 28 percent of the trips began in the Eastern Shore and 21 percent came across the Bay Bridge. Another 21 percent began in Virginia. The wide range of trip origins indicates that many of the trips are not local in nature.

Table ES-6
Trip Origins and Destinations

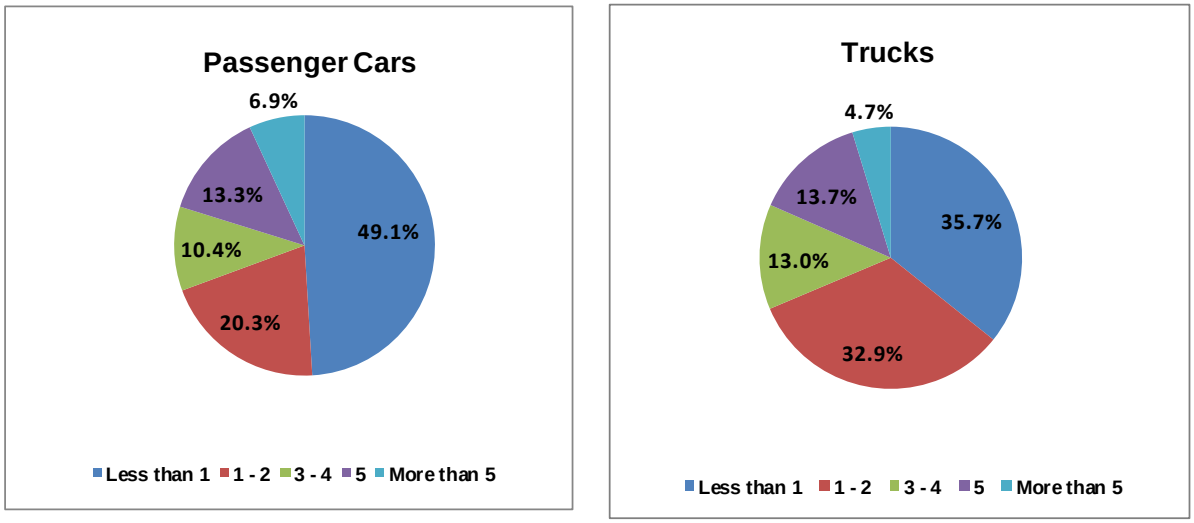
Trip Origins		
Location	Passenger Cars	Trucks
Delaware - New Castle County, South of C&D Canal	4.5%	0.3%
Delaware - Kent & Sussex Counties	3.7%	2.9%
Maryland - Via Bay Bridge	14.6%	21.1%
Maryland - Eastern Shore	64.5%	25.5%
Maryland - South Eastern Shore	2.2%	3.5%
Virginia	4.4%	21.2%
Others	6.2%	25.5%
Totals	**100.0%**	**100.0%**

Trip Destinations		
Location	Passenger Cars	Trucks
Delaware - Wilmington Area	7.1%	7.0%
Delaware - North of Canal	16.1%	10.1%
Delaware - South of Canal	40.3%	12.4%
Pennsylvania	14.6%	20.5%
New Jersey	12.1%	28.1%
New York	4.5%	9.0%
Others	5.3%	13.0%
Total	**100.0%**	**100.0%**

Delaware is the state with the highest number of trip destinations, with 64 percent of the passenger car trip destinations and one-third of the truck destinations. Of the passenger cars, 40 percent are going to locations south of the C&D Canal and 16 percent are going to New Castle County, between the Canal and the Wilmington area. Other major destinations for passenger cars are Pennsylvania (14 percent), New Jersey (12 percent) and New York (4 percent). For trucks, trip destinations are more evenly distributed with 26 percent going to New Jersey and 22 percent going to Pennsylvania. The truck trips to Delaware are distributed throughout New Castle County. The trip origins and destinations indicate that many of the trips are long distance and US 301 provides a logical alternative to using I-95 through the congested Baltimore area.

Additional data obtained during the survey provided information on trip frequency, trip purpose, use of the Chesapeake Bay Bridge and route used for reverse trip. With regard to trip frequency, half of the passenger car trips are made less than once a week, indicating infrequent users and 35.7 percent of the truck trips are made less than once a week, typical of long haul truck movements. Trip frequency for passenger cars and trucks is shown in Figure ES-4.

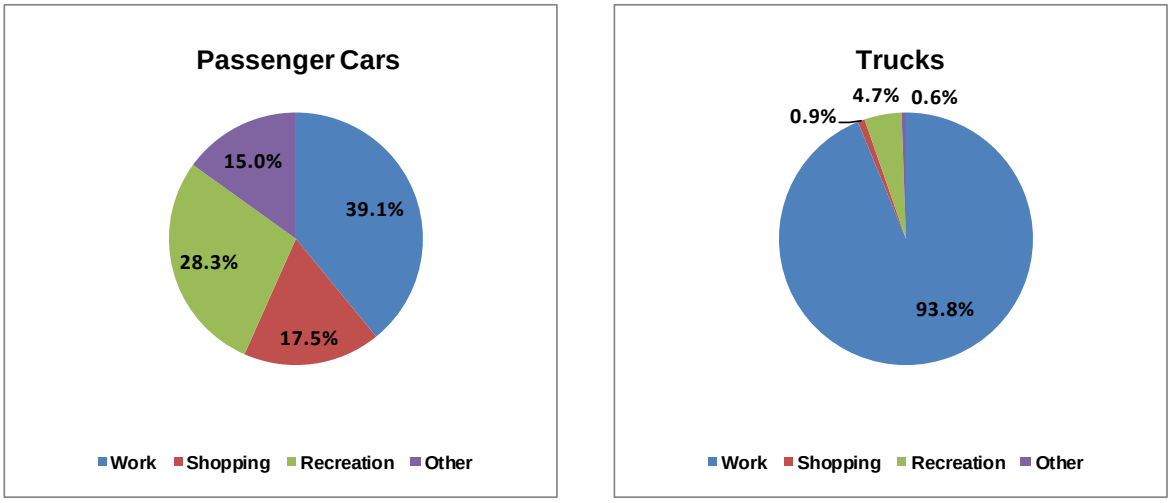
Figure ES-4
Trip Frequency



It should be noted that infrequent trip users are less likely to be knowledgeable about other local non-tolled roadways that are in the vicinity of the toll road and would not be likely to divert off of the US 301 Mainline Toll Road.

Regarding trip purpose, 39.1 percent of the trips by passenger cars are for business, which includes both commuter and other types of business trips, such as attending meetings. Approximately 94 percent of the truck trips are for business purposes. The trip purpose is shown graphically for passenger cars and trucks in Figure ES-5.

Figure ES-5
Trip Purpose



During the survey, motorists were asked whether or not they used the same route; i.e., US 301, for the return trip. Of the total round trips, 12.6 percent of the passenger cars and 23.4 percent of the trucks are using an alternative route for the return trip. This is to be expected since the competing parallel I-95 route is less costly in the southbound direction due to one-way northbound toll collection on the Maryland Turnpike. A higher percent of trucks is using the alternative for their reverse route since trucks have a higher sensitivity to tolls than passenger cars.

An additional question asked during the survey was whether or not the motorist used the Chesapeake Bay Bridge as part of the trip. Of the passenger cars, 24.1 percent used the bridge as did 67.7 percent of the trucks.

In October 2008 and November 2010, Stantec and RK&K conducted a series of travel speed runs along US 301 and the local parallel routes within the corridor. The surveys were performed via multiple trials in both peak and off-peak conditions.

The surveys found that the US 301 Corridor via Summit Bridge has only minor variations in travel time by direction and time of day. The lack of variation in travel time is a result of recent widening and other improvements to the alignment south of Middletown. Other local corridors exhibit minor variations in travel times and speeds. Route 299 between US 301 and SR 1 shows congestion in the peak periods. MD 213 has an average speed of approximately 44 MPH, which reflects a combination of low speeds near the small towns of Galena, Georgetown and Cecilton, with the remaining sections having a higher speed limit at 55 MPH. Note that these data are used in calibrating the model to ensure reasonable travel speeds for the local competing facilities.

ES.3 Modeling Methodology

The modeling methodology adopted for this project used two separate modeling procedures. The first procedure was the DelDOT Regional Model (also known as the Peninsula Model) which was used to develop estimates of overall travel flows in the form of vehicle trip tables for the region. The second procedure was a customized assignment process developed by Stantec to estimate toll diversion and traffic assignment. Stantec also obtained the Baltimore Metropolitan Council's (BMC) regional model network and trip tables to assist in abstracting travel west of the DelDOT regional model.

Stantec obtained the latest available 2008 base year and 2040 future year data sets for the regional model from the DelDOT and executed the regional model with a revised 2009 socioeconomic data set prepared for this project. The resulting trip tables were then used as inputs to the customized toll diversion model that performs the highway assignment and the toll diversion model was then calibrated to replicate traffic for all roadways in the corridor.

Future year networks were also prepared for each of the horizon years for the modeled period up to the year 2040. Stantec coded the committed and planned improvements to the highway network based on projects identified in the DelDOT's Statewide Regional Long-Range Transportation Plan, published in October 2010, as well as the DelDOT Capital Transportation Program Fiscal Years 2011-2016, published in September 2010; Dover/Kent County Metropolitan Planning Organization Regional Transportation Plan: A Long Range Transportation Plan for 2030; and Delaware Statewide Transportation Plan Update, List of Regionally Significant Projects included in the travel demand model for SIP/TIP Conformity, February 16, 2010. For Maryland, Stantec utilized the projects identified in publically available reports from Maryland DOT and WILMAPCO.

ES.3.1 Model Calibration

Utilizing existing count data and travel pattern data collected from the field surveys, Stantec performed a final model calibration for the toll diversion process to replicate traffic flows specifically within the US 301 Corridor. This model calibration also included specific analysis related to trips by vehicle type (auto, truck) as well as specific travel patterns that would utilize the US 301 Mainline Toll Road.

Stantec reviewed the model estimated speeds to ensure that values along the roadways in the vicinity of the US 301 Corridor and toll traffic predicted by the model are based on acceptable estimates of speeds and travel times in the corridor. This was an essential part of the model calibration since the level of congestion and potential travel time savings in the corridor are the primary factors influencing diversion of traffic to the tolled facilities.

Daily traffic volumes developed by the model were compared to actual; volumes at four key intercept lines encompassing the major facilities traversing the C&D Canal (MD 213, SR 896-Summit Bridge, SR 1, and US 13) and at the major toll plazas for the Delaware Turnpike and SR 1 and the entry points to the regional model.

The model closely replicates the observed total volumes crossing the screenlines as well as the auto and truck traffic on the key competing routes, MD 213 and existing US 301 at the state line. The model also adequately replicates the auto and truck traffic at the I-95 Newark plaza and the Chesapeake Bay Bridge that effectively intercept the majority of vehicles traveling along the competing I-95 and US 301 corridors. Stantec also adjusted the toll diversion model to replicate the observed traffic on the SR 1 and I-95 toll facilities, with particular emphasis on tolled traffic at the I-95 Newark Plaza.

ES.3.2 Toll Diversion Methodology

The proportion of traffic predicted to use the tolled lanes is estimated by a customized toll diversion model developed by Stantec and implemented within the highway assignment process. The toll diversion model was structured as binary logit model that estimated the probability of selecting a toll road based on tradeoff between travel time savings and associated toll costs. The toll diversion model was also structured to enable market segmentation by payment type (i.e., ETC, cash or video-tolling) thereby producing separate traffic forecasts for each market segment. As part of the model development effort, Stantec calibrated and validated the toll diversion model using the 2009 transaction statistics from the Delaware Turnpike and SR 1. It included an extensive validation effort to ensure that the model provides an appropriate level of sensitivity to key policies, such as variation in toll rates.

The values of time for auto trips used in the Toll Diversion Model vary by trip purpose within a range from $10.50 to $19.23 per hour. The weighted average value of time is approximately $15.45, which is approximately 52.0% of the wage rates for the study area counties. Trips with higher values, such as those associated with home-based-work trips and journey-to-work trips, indicate a greater willingness to pay a toll in order to save travel time. For trucks, a relatively high value of time of $45.53 per hour reflects the greater sensitivity related to the delivery of the commodities being transported and costs associated with truckers' salaries.

ES.4 Socioeconomic Forecasts

For this study, historical population and employment and population forecasts prepared by the U.S. Bureau of Census state agencies were reviewed; conversations were held with representatives of regional and local government agencies; windshield surveys were conducted; inventories were made of platted projects, maps and plans of the study area; and digital aerial photography and other relevant literature were reviewed. Based

on this information, and using professional judgment, adjustments were made to the socioeconomic forecasts in the DelDOT 2010 Regional Model.

The study area for this project is defined at two levels: the 12-county region included in the regional transportation model and the local area around the project.

The twelve counties included in the regional transportation model are: Kent, New Castle and Sussex counties in Delaware and Caroline, Dorchester, Kent, Queen Anne's, Somerset, Sussex, Talbot, Wicomico and Worchester counties in Maryland. The US 301 study area in the vicinity of the project consists of New Castle County south of the Chesapeake and Delaware Canal and portions of southwestern Cecil County and northwestern Kent County in Maryland.

ES.4.1 Historical and Projected Population Trends

The 2010 population within the 12-county regional model area was 1.3 million according to the U.S. Bureau of Census. During the period 2000 to 2010, the overall growth rate of the 12-county region was 14.2 percent, or a compounded annual growth rate (CAGR) of 1.3 percent, as shown in Table ES-7.

Table ES-7
Historical Population
Delaware Regional Model Area

Area	Estimated Total Population		Average Annual Growth Rate
	2000 Census	2010 Census	
Cecil County, MD	85,951	101,108	1.6%
Kent County, MD	19,200	20,197	0.5%
New Castle County, DE	500,272	538,479	0.7%
Study Area Counties	605,423	659,784	0.9%
Remaining 9 Counties	574,038	687,376	1.8%
Total	1,179,461	1,347,160	1.3%

Source: US Census Bureau

The baseline population control totals in the model were adjusted to develop control totals for each county in the 12-county study area. The socioeconomic data assessed for this study included Wilmington Area Planning Council's (WILMAPCO) 2011 forecasts for New Castle and Cecil counties and data from DelDOT's 2010 Peninsula model for the remaining counties. The revised control totals for the counties reflect the trends noted above and anticipate reasonably modest growth through the forecast year of 2040, while also accounting for a stabilization of the local economy in the near term. The population forecasts are shown in Table ES-8

Table ES-8
Projected Population
Delaware Regional Model Area

Area	Used in Model		Average Annual Growth Rate
	2010	2040	
Cecil County, MD	101,519	155,883	1.4%
Kent County, MD	20,226	23,580	0.5%
New Castle County, DE	536,583	598,896	0.4%
Study Area Counties	658,328	778,359	0.6%
Remaining 9 Counties	690,518	939,809	1.0%
Total	1,348,846	1,718,168	0.8%

ES.4.2 Historical and Projected Employment Trends

Total employment estimates from the U.S. Bureau of Labor Statistics' Quarterly Census of Employment and Wages (QCEW) for 2001, 2007 and 2010 for counties in the DelDOT Regional Transportation Model show that gains between 2001 and 2007 were lost between 2007 and 2010, typical of the response to the recession throughout the country, as presented in Table ES-9.

Table ES-9
Historical Employment
Delaware Regional Model Area

	Estimated Total Employment		
	2001	2007	2010
Cecil County, MD	25,573	30,763	27,822
Kent County, MD	7,914	8,600	7,659
New Castle County, DE	282,318	283,231	261,981
Study Area Counties	315,805	322,594	297,462
Remaining 9 Counties	235,414	266,911	253,186
Total	551,219	589,505	550,648

Source: US Bureau of Census

Baseline employment estimates for the counties were adjusted to the Delaware Department of Labor's and the Maryland Department of Labor, Licensing, and Regulation's QCEW data, as shown in Table ES-10. Using these data led to a lower employment estimate than the 2010 DelDOT model's assumptions. While there are some shortcomings to the QCEW employment estimates, such as not counting agricultural workers and the self-employed, they also are more likely than other data sources to accurately reflect the number of individuals who commute to work.

Table ES-10
Projected Employment
Delaware Regional Model Area

Area	Used in Model		Change	CAGR
	2010	2040	2010 - 2040	2010 - 2040
Cecil County, MD	27,988	46,071	18,083	1.7%
Kent County, MD	7,645	9,325	1,680	0.7%
New Castle County, DE	262,250	279,228	16,978	0.2%
Study Area Counties	297,883	334,624	36,741	0.4%
Remaining 9 Counties	253,342	320,496	67,154	0.8%
Total	551,225	655,120	103,895	0.6%

ES.4.3 US 301 Study Area Growth Patterns

The US 301 study area experienced significant residential and commercial development between 2000 and 2008 and, as residential growth has occurred, so has economic activity. The 12 counties within the DelDOT 2010 Regional Model area are currently experiencing modest population growth and stabilizing employment levels after the effects of the national recession. The area's growth patterns have also been influenced by changes in the Philadelphia-Washington-Baltimore corridor.

Population is anticipated to grow in the US 301 study area, although at more modest rates than prior to the current economic downturn. The overall level of employment within the US 301 study area has likely increased during the past few years with the opening of various retail stores and is expected to grow further with the construction of new medical facilities that will provide a significant increase to the study area's future employment. Both trends should support growing traffic volumes on the proposed US 301 Mainline Toll Road.

ES.5 Toll Collection Plan

The toll collection plan for the US 301 Mainline Toll Road utilizes a barrier/ramp system of pay points that ensures that all traffic using the facility will pay a toll. Table ES-11 lists the assumed toll rates for two-axle and five-axle vehicles for the 2015 opening year. The proposed toll collection plan also assumed a series of periodic toll increases starting in the year 2021.

Table ES-11
US 301 Mainline Toll Effective July 2015

Toll Location	Tolls *	
	2-axle	5-axle
Middletown plaza	$4.00	$11.00
Levels Road ramps	$1.00	$10.00
Summit Bridge Road ramps	$0.75	$10.00
Jamison Corner Road ramps	$0.50	$10.00

*Shown are the two-axle and five-axle tolls. Other multi-axle tolls are commensurate with the rates shown.

The tolls were calculated assuming 28.6 cents per mile for passenger cars and were rounded to the nearest 25-cent value to facilitate cash transactions in the initial years of operation.

Assumed increases of the proposed toll plan are structured to double the initial toll rates by 2036, which implies a compounded annual growth rate of approximately 3.5 percent. The increases are applied at five-year intervals beginning in 2021 and continue for the entire 40-year horizon period.

The toll collection policy for the US 301 Mainline Toll Road reflects the Department's desire to operate the facility with the same payment methods available on the I-95 Delaware Turnpike. In order to maximize the potential revenue from interstate patrons, a decision was made to permit cash and transponder payment methods at all paypoints. Similar to the toll policy on the Delaware Turnpike, no toll discounts for payment by transponders would be applied to the rates for US 301 Mainline Toll Road.

Within Maryland, the years for periodic toll increases and the escalated rates were established using recent approved increases for fiscal year 2012 and fiscal year 2014 and periodic adjustments thereafter for the entire forecast period.

In comparing the future rates for the long-distance trips via US 301 and I-95, it is important to note that the US 301 routing will maintain a lower overall toll cost when considering the total cost of all the paypoints on the I-95 routing. Table ES-12 lists the total toll costs for cash patrons using either route for several horizon years. As shown in the table, cost savings for the US 301 Mainline Toll Road are increasing as the over time, providing a competitive advance over the I-95 routing through Maryland.

Table ES-12
Future Toll Rates by Vehicle Type and Route

Year	Auto Tolls			5-Axle Truck Tolls		
	I-95	Bay Bridge / US 301	Cost Savings	I-95	Bay Bridge / US 301	Cost Savings
2015	$ 17.75	$ 10.50	$ 7.25	$ 88.25	$ 49.50	$ 38.75
2021	$ 21.75	$ 13.00	$ 8.75	$ 108.75	$ 61.50	$ 47.25
2031	$ 30.25	$ 18.25	$ 12.00	$ 152.75	$ 85.75	$ 67.00
2041	$ 41.50	$ 24.75	$ 16.75	$ 213.75	$ 119.25	$ 94.50

ES.6 Traffic and Toll Revenue Forecasts

Using the validated toll diversion model along with the anticipated growth in the socioeconomic data and the planned transportation improvements in the DelDOT Regional Model, Stantec developed traffic and revenue forecasts for the US 301 Mainline Toll Road, taking into account the initial (2015) toll schedule and periodic toll increases in 2021, 2026, 2031, 2036 and 2041. The forecast period (2015-2041) reflects the model's five horizon years ending with 2041.

Beyond 2041, the projected twentieth year of operation, revenues were projected out to 2055, the fortieth year of operation, with tolls continuing to increase every five years to the $12.00 for autos and $33.00 for 5-axle trucks by 2056. The development of the traffic and revenue estimates for the non-modeled years from 2015 through 2041 were performed with standard interpolation techniques. After 2041, the forecast was based on a linear extrapolation using the growth from the last 10 years of the modeled period which results in a tapering traffic growth rate (in percentage terms) over time.

Toll evasion for Cash and transponder (ETC) billing toll options was included in the forecast. A moderate ramp-up factor of 90 percent (traffic discounted by 10 percent) for the first year of operation (increasing to 100 percent by 2017) reflects the fact that US 301 is an established traffic corridor.

As part of toll revenue estimation, assumptions regarding evasion, general 'ramp-up', assumed ETC shares, a truck axle factor, and an annualization factor were adopted:

- *Truck Axle Factors:* The truck toll revenue estimates were developed by multiplying the truck toll transactions with the base 2-axle toll rate times an average truck axle factor. The truck axle multipliers were based on the vehicle classification data at each toll facility of US 301, I-95, and SR 1.

- *Annualization Factor:* The annual toll revenue estimates were developed by using an annualization process that calculates "annual toll revenue days" and converts typical weekday revenue estimates to an annual revenue. An annualization factor of 355 was developed based on permanent traffic count data from DelDOT for the count station on US 301 established at the Maryland Stateline.

- *Ramp-Up Factors:* Ramp-up is a term used to describe the period from when a toll road first opens to traffic until it achieves the steady-state traffic flows predicted by the travel demand model. Ramp-up factors of 90 percent and 95 percent were applied in 2015 and 2016.

- *Toll Evasion Factors:* Toll evasion rates were developed from available data and evasion experience from the Delaware Turnpike and SR-1. Evasion for cash transactions for manned booths at the mainline barrier were set at 0.3% while the automated coin machines at the ramp toll plazas were assumed to have a 1.5% evasion rate. Toll evasion rates for autos and trucks are assumed to be the same.

- *Transponder Tolling Assumptions*: Assumptions regarding the percentage of traffic with ETC transponders in future years were developed based on the historical ETC usage data from other toll facilities across the country and on the percent of vehicles already equipped with transponders recorded at the state line. In the period from 2008 through 2010, approximately 40 percent of the vehicles crossing the state line were equipped with transponders. It is assumed that 62 percent of the passenger cars and 54 percent of the trucks will be equipped with ETC transponders in 2015, gradually increasing to 77 percent for autos and 67 percent for trucks in 2041.

Table ES-13 lists the transactions by vehicle type and Table ES-14 lists the revenue by vehicle type by fiscal year at five–year intervals. Annual data are shown in the body of this report.

Table ES-13
US 301 Mainline Toll Road
Estimated Transactions

FISCAL YEAR	AUTO			TRUCK			TOTAL			
	CASH	ETC	TOTAL	CASH	ETC	TOTAL	CASH	ETC	TOTAL	%TRUCK
2016	6,173	10,592	16,765	1,381	1,692	3,073	7,554	12,284	19,838	15.5%
2021	6,260	15,040	21,300	1,540	2,493	4,033	7,800	17,533	25,333	15.9%
2026	6,019	17,924	23,943	1,597	2,948	4,545	7,616	20,872	28,488	16.0%
2031	5,790	18,905	24,695	1,702	3,352	5,054	7,492	22,257	29,749	17.0%
2036	5,965	20,178	26,143	1,856	3,790	5,646	7,821	23,968	31,789	17.8%
2041	6,431	21,733	28,164	2,078	4,246	6,324	8,509	25,979	34,488	18.3%
2046	6,774	23,200	29,974	2,269	4,625	6,894	9,043	27,825	36,868	18.7%
2051	7,114	24,675	31,789	2,456	5,040	7,496	9,570	29,715	39,285	19.1%
2056	7,459	26,159	33,618	2,643	5,455	8,098	10,102	31,614	41,716	19.4%

Table ES-14
US 301 Mainline Toll Road
Estimated Toll Revenue

FISCAL YEAR	AUTO REVENUE ($1,000)			TRUCK REVENUE ($1,000)			TOTAL REVENUE ($1,000)			
	CASH	ETC	TOTAL	CASH	ETC	TOTAL	CASH	ETC	TOTAL	%TRUCK REVENUE
2016	$6,904	$7,752	$14,656	$4,801	$5,761	$10,562	$11,705	$13,513	$25,218	41.9%
2021	$8,120	$12,826	$20,946	$6,067	$9,624	$15,691	$14,187	$22,450	$36,636	42.8%
2026	$9,655	$19,423	$29,078	$7,788	$14,047	$21,835	$17,443	$33,470	$50,914	42.9%
2031	$10,964	$24,176	$35,140	$9,672	$18,659	$28,332	$20,636	$42,835	$63,471	44.6%
2036	$13,150	$30,179	$43,329	$12,049	$24,146	$36,195	$25,199	$54,325	$79,524	45.5%
2041	$16,117	$36,933	$53,050	$15,442	$30,932	$46,374	$31,558	$67,866	$99,424	46.6%
2046	$18,867	$43,427	$62,294	$18,925	$37,896	$56,821	$37,792	$81,323	$119,114	47.7%
2051	$21,785	$50,782	$72,567	$22,290	$44,943	$67,233	$44,076	$95,725	$139,800	48.1%
2056	$24,912	$58,712	$83,625	$25,948	$52,606	$78,554	$50,861	$111,318	$162,179	48.4%

Given the toll plan and the higher level of truck transactions at the mainline toll plaza, the dominant share of revenue is related to tolls collected at the mainline plaza. Over the forecast period approximately 87 percent of the total revenue is obtained from patrons at the malinline barrier, many of which are long-distance trips.

ES.6.1 Impact on Other Routes

The impact on I-95/Delaware Turnpike revenue due to the implementation of the US 301 Mainline Toll Road was estimated in response to the anticipated diversion of some long distance trips from I-95 (via Baltimore). While the exact time savings for the individual trip origins west of the Chesapeake Bay will vary depending on their proximity to the I-95-based routing and the US 50/US 301 routing, the improved travel times from the US 301 Mainline Toll Road should result in some diversion to the new toll road.

Using information from the 2011 origin-destination survey and the distribution patterns from the Baltimore Metropolitan Council's regional model, Stantec has made assumptions of the number of trips that would divert to US 301 Toll Road. These trips are assumed to enter the toll road at the mainline plaza and travel the entire length of the toll road to access SR 1 and continue to destinations beyond Middletown.

It is estimated that in the first year of operation, approximately 2.1 percent of the transactions on the new toll road and approximately 2.8 percent of the revenue on the US 301 Mainline Toll Road will be the result of diversions from I-95. By the end of the model-based forecast period (2041), traffic being diverted from I-95 represents 1.9 percent of transactions and 2.4 percent of total revenue on the US 301 Mainline Toll Road.

The higher percentage of revenue in comparison to the percentage of transactions is due to the fact that truck trips represent a larger share of the traffic being diverted to the new toll road. Since toll rates for the Delaware Turnpike's I-95 plaza are nearly identical to the toll rates for the US 301 Mainline Toll Road, any revenues diverted from the Turnpike system will be offset by revenues gained on the new toll road. It should be noted that this loss of revenue on the Delaware Turnpike is relatively minor given that currently there are more than 71,000 daily transactions at the Newark Toll Plaza.

Traffic at two screenlines was summarized to identify any changes in traffic patterns resulting from the new toll road. A screenline north of the project paralleling the C & D Canal indicates that there will be a noticeable diversion in 2015 to the SR-1 Bridge across the C&D Canal just above the merge point with the new toll road. This diversion is related to the improved travel times for accessing locations north of the canal provided by US 301 Mainline Toll Road and the fact that the US 301 route designation will be altered so the US 301 will now merge with SR-1 rather than use the existing alignment that is shared with SR-896. As a result, traffic on the existing US 301 alignment that uses the Summit Bridge shows a lower rate of growth. The percentage shares of the other north-south roadways show only minimal changes in response to the new toll road.

A second screenline was established south of the project corridor to identify diversions for traffic south and west of Middletown. Traffic volumes on US 301 south of Middletown near the proposed mainline barrier continues to shows an increasing share of the overall corridor traffic in response to the reduced travel times provided by the new toll road. Note that several local roads indicate an increase in the share of corridor traffic. This increase is due to development growth and for some local traffic these roadways provide a non-tolled route into Middletown.

ES.7 Sensitivity Analysis

Stantec performed a series of sensitivity analysis trials in the 2015 opening year to quantify the impact to transactions and revenue in response to changes in the baseline forecast assumptions. The results of these trials are listed in Table ES-15. In the first test, the suspension of the second scheduled toll increase planned by MdTA in FY 2014 would result in a minimal increase in transactions and revenue for the US 301 Mainline Toll Road. Similarly if no diversion of current traffic on I-95 is assumed, there would be a loss of 2.1% of transactions and 2.8% of revenue.

Table ES-15
Transaction and Revenue Impacts for Sensitivity Scenarios

TOLL ROAD SCENARIO	DESCRIPTION	%LOSS COMPARED TO BASE SCENARIO	
		TRANSACTIONS	REVENUE ($1,000)
No Toll Increase in 2014	US 301 Mainline Build, and only 2012 Maryland's Toll Increase in-place, and with I-95 Diversion	0.1%	0.1%
No I-95 Diversion	US 301 Mainline Build and No I-95 Diversion	-2.1%	-2.8%

1 INTRODUCTION

The traffic and toll revenue forecasts for the proposed US 301 Mainline Toll Road have been prepared in connection with Delaware Department of Transportation's (DelDOT's) financing of the project. The purpose of the US 301 Corridor Improvements, of which the US 301 Mainline Toll Road is a component of, is to reduce existing and projected roadway congestion, improve safety, and manage long-haul auto and truck traffic through the rapidly growing area surrounding Middletown, Delaware. DelDOT has conducted the analysis of the US 301 Corridor Improvements since 2004 to identify and evaluate alternatives that improve traffic flow in the US301 / SR 896 Corridor. Multiple alternatives were evaluated and a preferred alternative was selected as part of an extensive NEPA study. The Final Environmental Impact Statement (FEIS) was approved on November 30, 2007 and the Federal Highway Administration (FHWA) granted final approval of the proposed US 301 Mainline Toll Road on April 30, 2008.

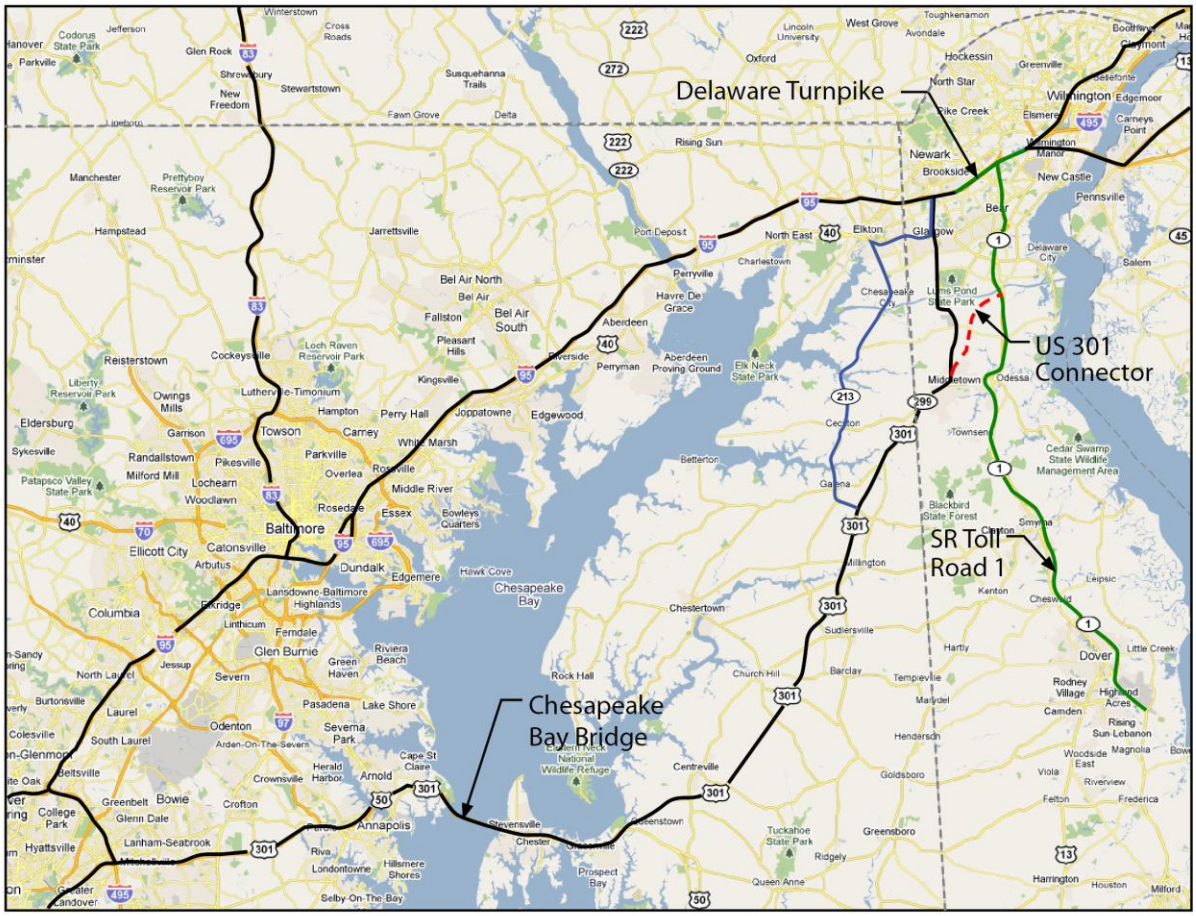
In association with DelDOT's general engineering consultant for the project, Rummel, Klepper, & Kahl, LLP (RK&K), Stantec Consulting Services Inc. (Stantec) has conducted this investment-grade study to estimate traffic and revenue for the proposed US 301 Mainline Toll Road. This study was a continuation of ongoing toll feasibility analysis conducted since 2005 in conjunction with alternative analysis and environmental studies that were performed to obtain federal approval to implement the new facility. During the course of these prior studies, the latest available estimates of current population and employment along with anticipated future development and changes in land use were utilized. This report presents the estimates of the traffic and toll revenue for the project configuration based on the final approved alignment. The traffic and revenue estimates were developed using an enhanced version of the DelDOT Statewide Transportation Model as well as the latest version of the Stantec Toll Diversion Model. Forecasts were prepared for a 40-year horizon period consistent with the anticipated financing.

1.1 US 301 Corridor and Mainline Toll Road

The Maryland section of US 301 is a 4-lane high speed, at-grade divided highway with some grade-separated interchanges at major cross-roads. Given the relatively rural area that US 301 traverses and the grade separated interchanges at major crossroads, the roadway functions primarily as a rural expressway for nearly 60 miles from the Chesapeake Bay Bridge to the State Line just west of Middletown, Delaware. Within Delaware, US 301 is configured as an arterial with signalized intersections in Middletown and its alignment extends northward over the C&D Canal to US 40 and the Delaware Turnpike (I-95) via SR 896. From Middletown, traffic on US 301 can also access SR 1 and US 13 via either SR 299 or SR 896. Figure 1-1 shows the extent of

the proposed US 301 Mainline Toll Road along with I-95/Delaware Turnpike and SR 1, Delaware's other toll roads in the Chesapeake Bay region and Delaware Peninsula. Note that other toll facilities in Maryland such as the I-95 JFK Expressway and the Baltimore Harbor crossings also influence the longer-distance travel patterns that could potentially use US 301.

Figure 1-1
Principal Routes in the Delaware / Chesapeake Bay Region



The proposed US 301 Mainline Toll Road provides a limited access roadway, extending from the Maryland's US 301 at the state line, west of Middletown, to SR 1, north of the Biddles Toll Plaza and south of the C&D Canal. This alignment effectively allows long-haul traffic to traverse the rapidly growing Middletown area without using the existing arterial roadways. Furthermore, this new roadway will enable long-haul traffic destined to locations in the northeast region to utilize the higher-speed limited access SR 1 to reach the Delaware Turnpike rather than to access the Turnpike via existing arterials that comprise US 301 and SR 896 south of Newark.

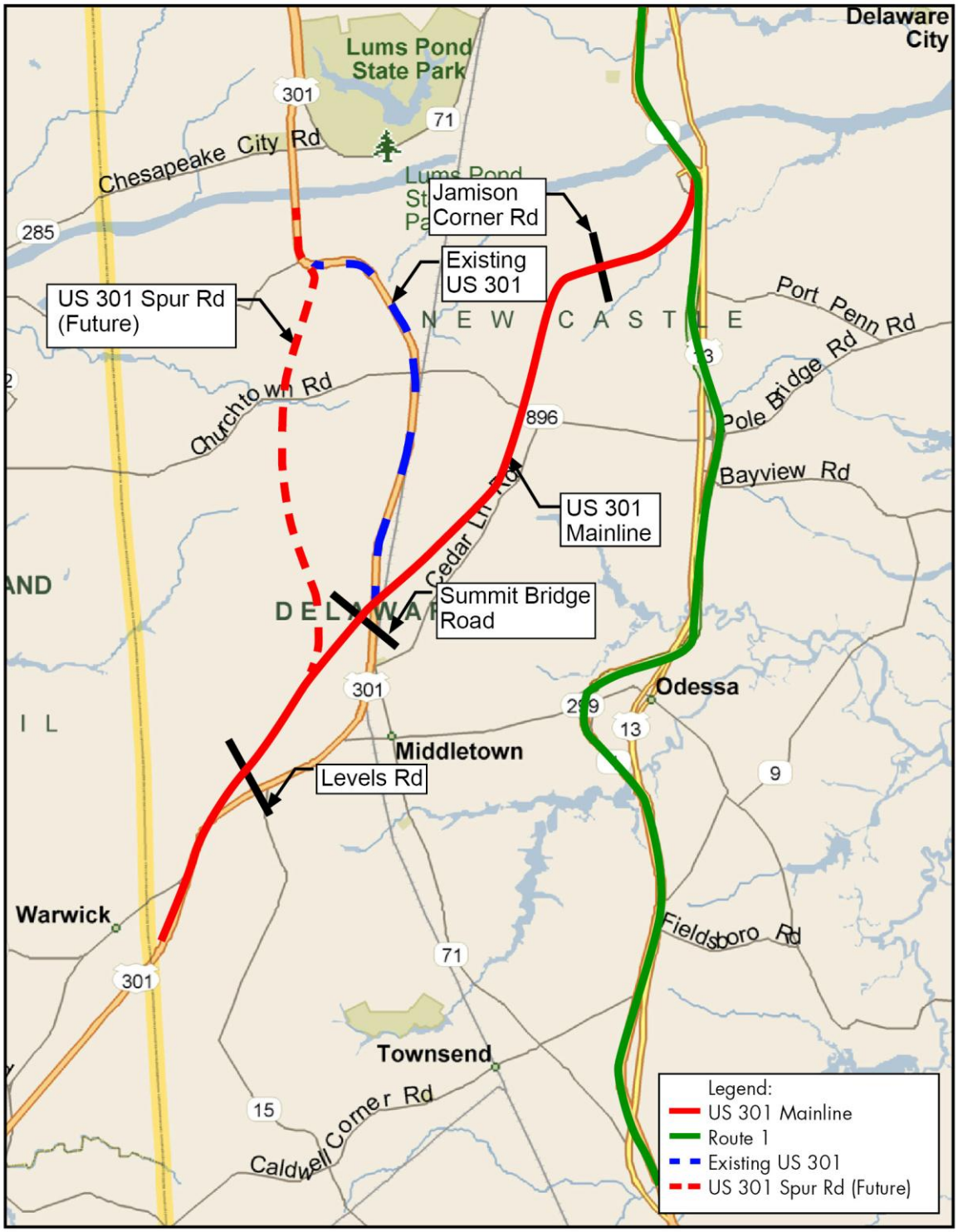
The alignment of the US 301 Mainline Toll Road is shown in Figure 1-2. The new toll road will have interchanges at Levels Road, Summit Bridge Road (Existing US 301 Alignment) and Jamison Corner Road. Note that with the completion of the new toll road, the existing US 301 Alignment near Middletown would have a different state route designation which has not yet been determined. Traffic would be able to use the proposed Summit Bridge Road Interchange to access SR 896 to cross the C&D Canal via the Summit Bridge. The US 301 Mainline Toll Road Project also includes a Spur Roadway as a future project that would provide a direct connection to SR 896 immediately south of the Summit Bridge. For this Traffic and Revenue Report, it is assumed that the US 301 Spur Road will be financed after the US 301 Mainline Toll Road is financed and that the US 301 Spur Road will not be constructed until after the US 301 Mainline Toll Road is opened to traffic.

1.2 Study Purpose and Scope

The purpose of this study was to prepare investment-grade traffic and toll revenue forecasts for the proposed US 301 Mainline Toll Road. This study identified the current demographic and economic trends in the Middletown, Delaware region and incorporated these trends into a review and adjustment of socioeconomic forecasts from the DelDOT Regional Travel Demand Model. The study also utilized an extensive set of traffic data collected over the last several years as well as the latest available version of the DelDOT regional model as the basis for this analysis. Additional traffic data were collected to replicate the current travel characteristics by surveying travel speeds in major corridors, traffic counts by vehicle classifications at significant locations, and origin-destination travel patterns in the project area. Future year highway network improvements for the background highway network were identified from the capital programs and long range plans in the project study area of Delaware and Maryland. The configuration and anticipated completion dates for the project improvements were confirmed by discussions with the relevant state agencies.

The DelDOT regional model was used as the basis for predicting overall travel demand in corridor including the long-distance trips that comprise the key market for the project. As part of this effort, the regional model was reviewed for consistency and logic. The regional model generated estimates of overall demand in the form of trip matrices for each horizon year using the adjusted socioeconomic data for the future horizon years along with the anticipated growth in long-distance trips from beyond the region.

Figure 1-2
US 301 Mainline Toll Road Alignment



The trips estimated from the DelDOT model were converted into time-of-day trips for use in the customized toll diversion model developed by Stantec. The toll diversion model was calibrated to replicate the 2009 observed tolled traffic on Delaware's toll facilities as well as other non-tolled roadways including US 301 at the state line. The customized toll diversion model was then used to forecast tolled traffic and generate a gross revenue stream for the 40-year forecast period. The model estimates were adjusted for both ramp-up and evasion. As part of this effort, sensitivity analysis was also performed for several scenarios as discussed in Chapter 10.

1.3 Organization of the Report

The traffic and revenue report has been organized into a series of chapters. The contents of each chapter are described as follows:

- Chapter 2 – Project Description – provides a summary of the project alignment and its connections to the existing roadway network. This chapter also summarizes the proposed toll collection plan and the configuration of adjacent roadways that are altered as part of the project alignment.

- Chapter 3 – Existing Travel Patterns – summarizes the traffic conditions in the project area such as the traffic trends for the existing US 301, the daily traffic counts for the major roadways in the study area, the travel speeds for the major corridors, and the origin-destination travel patterns for autos and trucks. This data was also used to calibrate the toll diversion model for conditions in the year 2009.

- Chapter 4 – Modeling Methodology – describes the overall modeling methodology developed for the study. This includes the application of the DelDOT Regional Model as well as the development and calibration of the toll diversion model.

- Chapter 5 – Socioeconomic Forecasts – provides independent estimates of current conditions as well as revised forecasts that reflect the current economic conditions for the region. This analysis was prepared by our subconsultant, Alliance Transportation Group.

- Chapter 6 – Toll Collection Plan – describes the tolling plan and rates by vehicle class and payment types for the proposed US 301 Mainline Toll Road. The chapter also includes the future toll rates for the assumed periodic rate increases for the US 301 Mainline Toll Road. Future year toll rates for other facilities are described in Chapter 7.

- Chapter 7 – Background Highway Improvements – summarizes the major project improvements identified in the capital program as well as the long range plans for Delaware and Maryland. These project improvements are included in the future background highway networks as well as the assumed rate increases for the competing toll facilities in Maryland and the Delaware Turnpike. Lastly, the chapter includes a description of the proposed truck restrictions on local roadways adjacent to the proposed mainline toll plaza near the state line.

- Chapter 8 – Traffic Forecasts – provides a summary of the daily toll transactions for the 40-year horizon period from the opening in July of 2015 to 2056. The traffic diversion from major corridor screenlines is also analyzed.

- Chapter 9 – Toll Revenue Estimates - presents the annual toll revenue forecast with the assumptions of annualization and ramp-up for the base case conditions. This chapter also includes a discussion of limitations and disclaimers related to the forecasts.

- Chapter 10 – Sensitivity Analysis – analyzes the impacts of varying input assumptions, such as changes in committed future toll increases on MdTA toll roads and no diversion from existing I-95 traffic.

2 PROJECT DESCRIPTION

This chapter provides a comprehensive description of the US 301 Mainline Toll Road and its connections with the existing roadway network. As part of this chapter a description of the proposed toll collection plan is provided as well as the configuration of adjacent roadways that are altered as part of the project alignment.

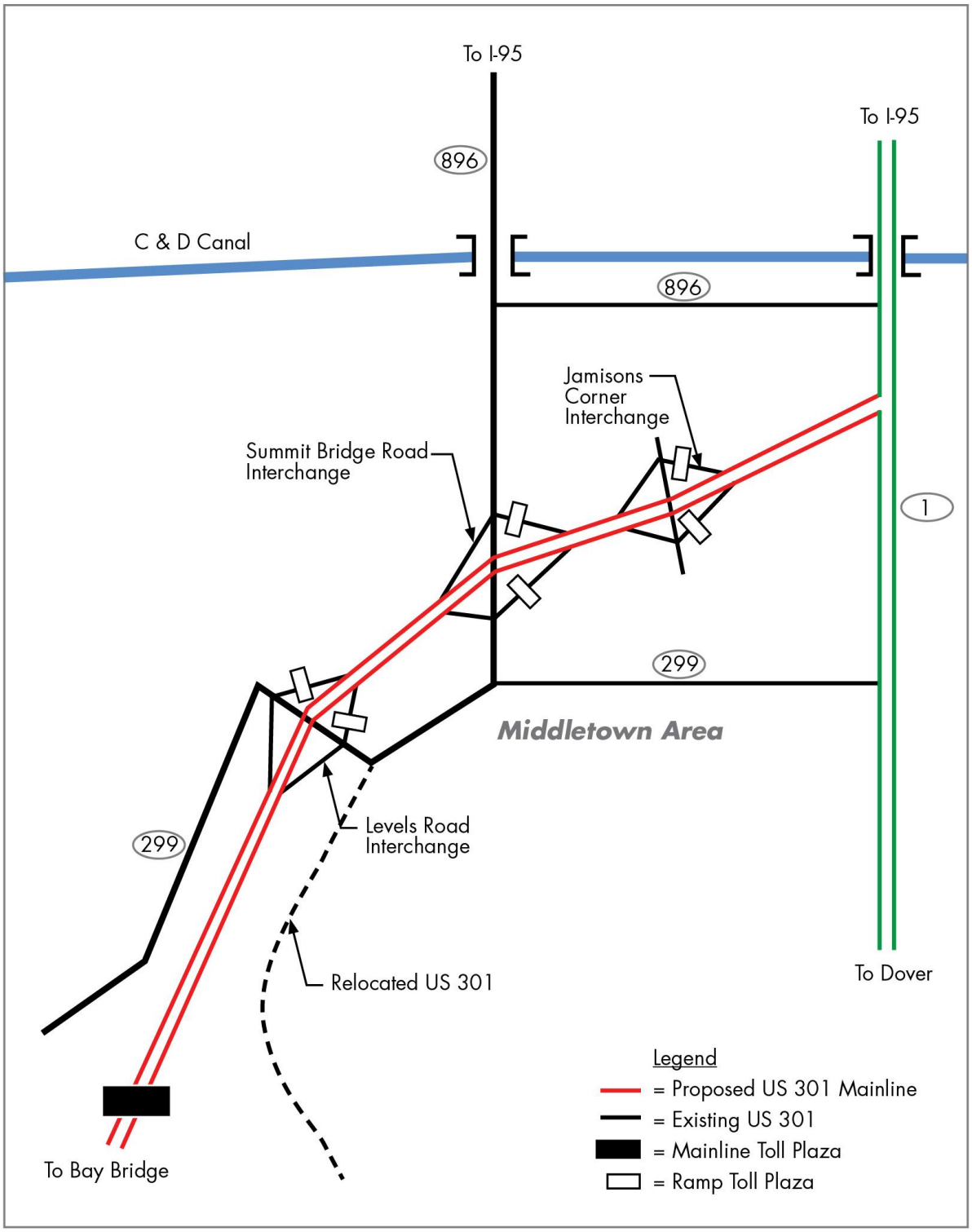
2.1 US 301 Mainline Toll Road Alignment

The US 301 Mainline Toll Road will improve travel along existing US 301 in the Northeast Corridor between Wilmington, Delaware and Washington, D.C. US 301 provides an attractive alternative to traveling on the highly congested sections of I-95 through the Baltimore region even with the congested section of US 301 that traverses Middletown Delaware. US 301 in Maryland is a controlled-access roadway between the Delaware line and the Chesapeake Bay Bridge, with limited at-grade intersections. The US 301 Corridor Improvements will extend from a connection with the Maryland section of US 301 at the state line passing west of Middletown, and then northward and eastward, tying into SR 1 south of the C&D Canal. Accordingly, US 301 Mainline Toll Road will be routed via SR 1 over the Canal Bridge and the present routing designation via SR 896 to US 40 will be removed. The conceptual alignment is provided in Figure 2-1.

As discussed previously in Chapter 1, the US 301 Mainline Toll Road will provide a limited access roadway with a direct connection to SR 1 just north of the existing Biddles Toll Plaza on SR 1. The 14-mile project will replace the section of US 301 that is predominately a two-lane arterial with uncontrolled access and numerous traffic signals. This existing section of US 301 is currently utilized by a significant volume of trucks relative to autos which traverses the west side of Middletown. For long distance trips that currently cross the C&D Canal via the Summit Bridge to access the Delaware Turnpike using the existing arterial system, the US 301 Mainline Toll Road will provide a high-speed option to access the SR 1 bridge and continue northward on SR1 to reach the Turnpike. Trips destined to local areas surrounding Middletown and areas north of the Canal along existing US 301 will use the proposed interchanges at Levels Road, Summit Bridge Road, or Jamison Corner Road.

The new toll road will be constructed as a four-lane limited access roadway with a total length of approximately 14 miles. The first segment from SR 1 south the interchange with Jamison Corner Road is approximately 2.3 miles. The next two segments to the Summit Bridge Road interchange and the Levels Road interchange are 3.7 and 3.4 miles respectively. The final segment of approximately 4.6 miles south of Levels Road provides to the connection with existing US 301 at the Maryland state line. For this analysis, it was assumed that the US 301 Mainline would be completed by July 2015.

Figure 2-1
US 301 Mainline Toll Road



2.2 Toll Collection Plan

As shown in the schematic in Figure 2-1 toll charges are assessed at a mainline barrier just east of the Maryland state line and at the ramps serving traffic to/from the north at each of the interchanges. Under this plan, ramp tolls at the Levels Road, Summit Bridge Road, and Jamison Corner Road interchanges would be collected on the respective ramps to/from the north at appropriately lower rates for autos, while trucks would pay only one dollar less than the mainline rate. The toll collection plan is designed as a "closed system" that requires all trips using the facility to pay a toll. Note that each trip will traverse only one pay point and that trips continuing onto SR 1 and crossing the C&D Canal will not pay toll charges on SR 1 since the proposed interchange is north of the final paypoint (existing Biddles Toll Plaza) on SR 1.

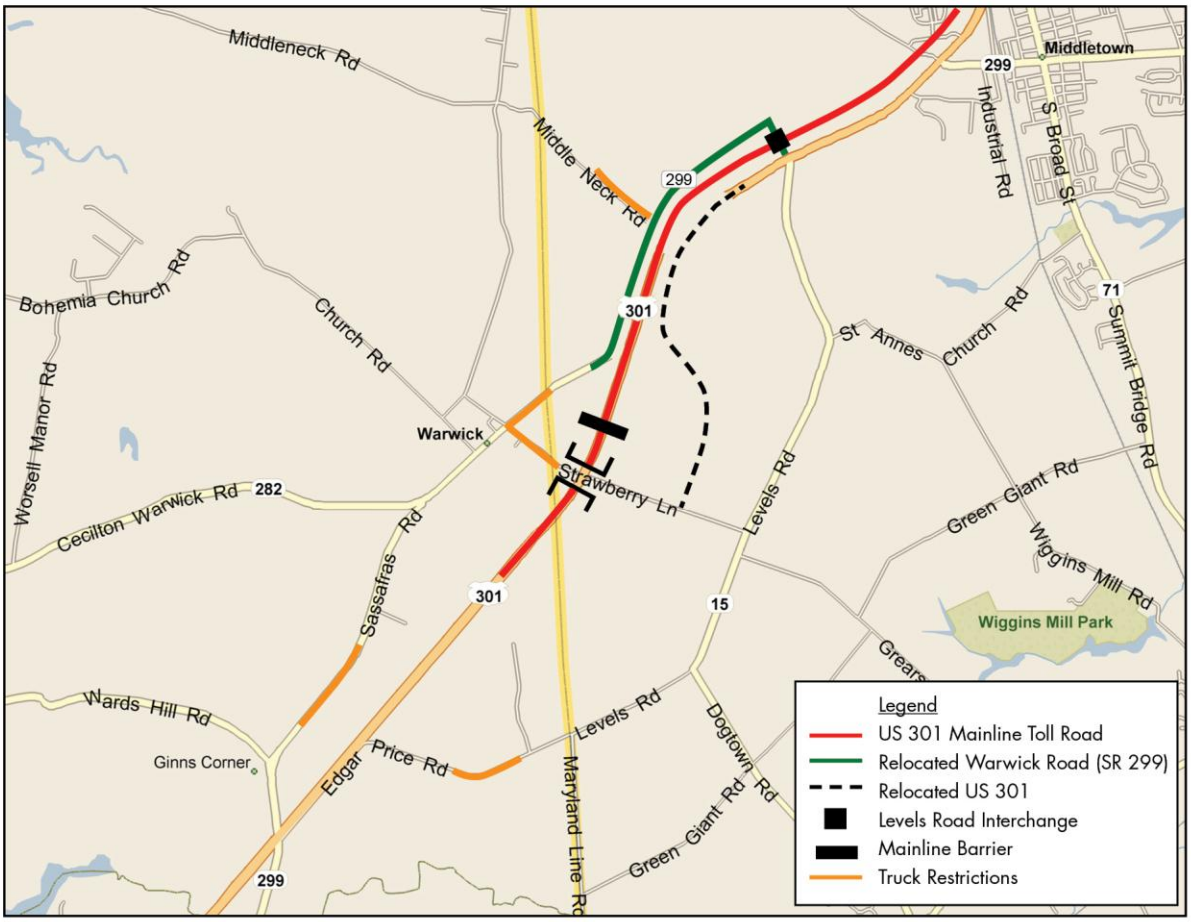
Similar to the existing toll collection plan for the Delaware Turnpike, toll charges will be paid either with cash or with transponders. Video recognition of vehicles will be used only as an enforcement mechanism. Cash transactions will be provided at all paypoints with manned booths at the mainline plaza and automated coin machines at the ramp plazas. Similar to the Delaware Turnpike and SR 1, toll rates for different vehicle types will be based on the number of axles. The description of the toll rates by paypoint and horizon year are provided in Chapter 6.

2.3 Adjacent Roadway Modifications

The implementation of the US 301 Mainline Toll Road will include a series of modifications to the existing roadway network. These modifications will include the removal of existing intersections and a series of grade separated crossings and interchanges. The route designation of certain roadways will be altered and a series of truck restrictions will also be implemented to prohibit trucks from using local roads adjacent to the new toll road. Figure 2-2 provides a schematic of the proposed changes near the mainline plaza.

As noted above three new interchanges will be created to provide grade-separated crossings of major roadways near Middletown. In the vicinity of the mainline plaza along the existing US 301 alignment there will be a series of modifications that alter the current movements between US 301 and the local roads. The existing intersection with Strawberry Lane will be removed and a bridge on Strawberry Lane will be constructed to pass over US 301 Mainline. The existing arterial section of US 301 south of the proposed new Levels Road Interchange will be converted to a frontage road that terminates at Strawberry lane. Warwick Road will also be realigned and connected to the proposed Levels Road Interchange. The existing section of US 301 north of Levels Road would be a different state route designation which has not yet been determined.

Figure 2-2
Roadway Modifications near Mainline Plaza



The conversion of US 301 to a tolled facility requires that notification be given to travelers prior to entry to the toll road. For northbound traffic, the last at-grade intersection on US 301 in Maryland at Sassafras Road will be signed to advise northbound traffic that US 301 is tolled beyond this intersection, but there will not be signage directing travelers to a designated non-tolled roadway.

Figure 2-2 also displays a set of truck restrictions in the vicinity of the mainline plaza. These restrictions will effectively prohibit truck traffic from using local roadways to bypass the mainline toll plaza. As shown in the figure, the prohibitions on Warwick Road, Sassafras Road, Edgar Price Road, and Middle Neck Road will effectively block through truck traffic. Note that a complete listing of restricted roadways with description of the restricted segments is provided in Chapter 7 as part of the background network modifications. Due to planned truck restrictions, it is assumed that most of any northbound trucks seeking a non-tolled alternative route will exit US 301 at MD 313 in Maryland in order to access MD 213 and travel north to US40 to bypass Middletown.

3 EXISTING TRAVEL PATTERNS

This chapter describes the existing traffic count data as well as travel patterns in the project area that supported the development and calibration of the travel demand model for this project. Note that these data have been collected over several years from 2005 through 2010 as various planning and feasibility assessments were performed. The traffic data collection was focused primarily on obtaining current traffic counts at specific locations within the US 301 corridor. General origin-destination surveys were collected by roadside survey conducted in August, 2011 for this study to update surveys done in 2005 and a video license plate survey was performed in 2008 to confirm specific routing patterns for northbound US 301 traffic as it approached the state line. Travel time/speed surveys were conducted for selected routes in the corridor in 2005 and 2010 by RK&K, and Stantec staff also performed travel times and speed surveys for selected roadway sections of the corridor. RK&K provided the additional traffic count data performed in 2008, 2009 and 2011 and count data were obtained from DelDOT and the Maryland State Highway Administration (SHA) for 2009, 2010 and 2011. The study also utilized an extensive set of traffic data collected over the last several years at the permanent count station installed at the state line in July, 2008.

3.1 Historical Traffic, 2000-2010, on US 301 and MD 213

Table 3-1 lists the traffic growth at permanent count stations on US 301 in Delaware and MD 213 from 2000 to 2010. Although MD 213, as an existing 2-lane roadway is not a significant competing route currently, (its volume is approximately 57 percent of the volume on US 301 at the state line) as shown previously in Figure 1-1, it has the potential to be competing non-tolled route, especially for trucks, when the US 301 Mainline Toll Road is completed. However, it should be noted that the speed along this route through several small towns and the signalized intersections will limit the attractiveness of the route.

Table 3-1
US 301/MD 213 Traffic Growth, 2000-2010

Year	US 301[(A)]		MD 213[(B)]	
	AADT	Change	AADT	Change
2000	12,188		9,894	
2001	12,675	4.0%	9,814	-0.8%
2002	14,399	13.6%	10,410	6.1%
2003	14,439	0.3%	10,409	0.0%
2004	14,613	1.2%	10,829	4.0%
2005	14,725	0.8%	10,784	-0.4%
2006	14,611	-0.8%	10,706	-0.7%
2007	15,552	6.4%	10,402	-2.8%
2008	15,581	0.2%	10,088	-3.0%
2009	14,259	-8.5%	9,022	-10.6%
2010	14,435	1.2%	8,260	-8.4%

Notes:
(A) North of Warwick Road (SR 299) Permanent ATR 8016
(B) Near MD 310 (Permanent ATR P0058) - South of C&D Canal

The average daily traffic (AADT) along US 301 has an average annual growth of 1.7% between years 2000 to 2010. During this period, there were periodic upward spikes in several years. For example, in 2007, the AADT increased considerably at a rate of 6.4% compared to traffic from previous year as shown in Table 3-1. The increase could be attributed to traffic diverting from I-95 due to the toll increase at the I-95 Newark Toll Plaza that year. The auto and truck toll rates were increased from $3.00 to $4.00 and from $8.00 to $9.00 (5-axle rate), respectively. A similar upward spike can also be seen in the 2002 AADT. Traffic grew significantly from 2001 to 2002. This growth could be attributed to the significant toll increase at the I-95 Kennedy Toll Plaza in 2001, in which both auto and truck (5-axle) rates were doubled, causing traffic diversion from I-95 to US 301. Traffic was reduced in 2009 by 8.5% compared to the 2008 AADT. The decreased traffic could be attributed both to the economic recession and construction along US 301 in Middletown.

In addition to the permanent count station locations summarized in Table 3-1, DelDOT recently installed a new permanent count station on US 301 immediately adjacent to the state line in the vicinity where the proposed mainline toll plaza for the US 301 Mainline Toll Road would be located. This new station has been operational since July of 2008 and full year data for 2009 and 2010 are available. As shown in Table 3-2 the change in between 2009 and 2010 indicates a slight increase but note that overall traffic is lower than the permanent count Station 8016 located further north since that location includes traffic merging onto US 301 from SR 299 (Warwick Road).

Table 3-2
US 301 Traffic Growth 2008-2010

Year	US 301(A)		US 301(B)	
	AADT	Change	AADT	Change
2008	15,581			
2009	14,259	-8.5%	10,838	
2010	14,435	1.2%	11,009	1.6%

Notes:
(A) North of Warwick Road (SR 299) Permanent ATR 8016
(B) North of MD state line near proposed mainline toll plaza

The new permanent count station at state line also provides classification counts and an estimate of the percentage of vehicles with transponders. Table 3-3 provides a summary of that data for 2008 through 2010. As shown in the table the percentage of truck traffic, which includes all vehicles with 3 or more axles as well as 2-axle – 6 tire vehicles, is approximately 22.0 percent. This value is consistent with the truck percentages recorded at permanent count station 8016, just to the north of Warwick Road, which indicates a value of 21.6 percent in 2007.

Table 3-3
US 301 Traffic Growth, 2008-2010

Year	Auto AADT		Truck AADT[A]		Percent Truck		Vehicle with ETC[B]	
	Volume	Change	Volume	Change	Percent	Change	Percent	Change
2008[C]	8,449		2,336		21.7%		40.0%	
2009	8,409	-0.5%	2,429	4.0%	22.4%	3.2%	39.5%	-1.3%
2010	8,547	1.6%	2,462	1.4%	22.4%	0.0%	39.0%	-1.3%

NOTES:
[A] Trucks include 2-axle, 6-tire vehicles
[B] Vehicles Equipped with Transponders
[C] 2008 data includes the period of July through December

The percentage of vehicles with transponders is approximately 40 percent and this value is largely unchanged since the new permanent count location was established in July of 2008. The slight reduction in transponder shares in 2010 could be related to a slightly lower share of long distance trips as a result of the 2008 recession.

3.2 Truck Classification Data

Truck classification counts were performed by RK&K in 2005, 2006 and 2008 at locations throughout the corridor. Stantec Staff also obtained existing classification data from DelDOT and Maryland SHA for other locations. Using the new permanent count station on US 301 at the state line, the number of trucks by axle category was estimated for 2009, as shown in Table 3-4.

Table 3-4
US 301 Traffic by Vehicle Class for 2009

Vehicle Class	Volume	Percent of	
		Total	Truck
2 axle 4-tire	8,409	77.6%	
2 axle 6-tire	550	5.1%	22.6%
3 axle	62	0.6%	2.6%
4 axle	145	1.3%	6.0%
5 axle	1,642	15.2%	67.6%
6 axle	30	0.3%	1.2%
Total	**10,838**	**100.0%**	**100.0%**

Note that approximately 67 percent of the truck volume is in the 5-axle category. These larger trucks are normally long-haul truck trips as confirmed by the origin-destination survey data collected in 2005 and 2011, as discussed below in Section 3.4.

In addition to the traffic counts at the state line, Stantec also compiled count and classification data for the year 2008 at several locations along US 301 and it's shared alignment with SR 896 between Middletown and US 40 at Glasgow as listed below in Table 3-5. The sections of US 301 listed in this table, along with other roadways link US 301 to SR 1 and US 13, encompass the primary routes between the Delaware Turnpike and US 301 in Maryland. Note that the 2008 traffic data at the locations near the center of Middletown was lower than previous years due both to the economic recession and the recently completed US 301 reconstruction project.

Table 3-5
US 301/SR 896 Traffic Profile (to be updated to 2010)

Route	Location	2008 AADT			Percent Truck
		Auto	Truck (A)	Total	
US 301/SR 896	South of US 40	29,300	2,500	31,800	7.9%
US 301/SR 896	Summit Bridge (C&D canal)	23,600	2,500	26,100	9.6%
US 301/SR 896	North of SR 896/Mt. Pleasant	20,600	3,200	23,800	13.4%
US 301	West of Middletown	12,800	3,600	16,400	22.0%
US 301	Maryland State Line(B)	8,500	2,300	10,800	21.3%

(A) Truck includes 2-axle 6-tire

(B) Volumes at Stateline obtained from July-December Period

Note that while the corridor volume is highest north of the Summit Bridge, the truck volumes are highest west of Middletown, and particularly south of the Mount Pleasant intersection, where SR 896 (Boyds Corner Road) connects US 301 with SR 1 and US 13. This reflects the merge point of the two principal alternative routings available to long distance US 301 traffic at the Mount Pleasant intersection.

3.3 Travel Time / Delay Data

Travel time and speed data were collected for various roadway segments both for local routes near the proposed mainline toll plaza as well as for long-haul routes serving longer distance travelers. These data were collected periodically by RKK and Stantec Staff in 2005, 2008, and 2010. In 2005, local adjacent roadways travel times and speeds were estimated for existing segments that would be likely routes used to bypass the proposed mainline plaza. These data and the assumed travel time for the tolled route are shown in Table 3-6. Since trucks would be prohibited from using a section of MD 282 in the first option in the table, the second option represents a potential non-tolled truck option.

Table 3-6
US 301 Corridor Current and Projected Travel Times and Distances

Mode	Route End Points	Route	Distance (Miles)	Time[A] (Min.)	Speed (MPH)
Auto	SR-1/I-95 & US 301/MD 313	Via I-95, SR896, Existing US 301, SR 299 & MD 282	33	52	38
		Via SR 1 and Proposed US 301 Connector Toll Road	29	28	62
		Saving via US 301 Connector Toll Road	4	24	
Trucks	SR-1/I-95 & US 301/MD 313	Via I-95, SR 896, US 40, MD 213, & MD 313	35	55	38
		Via SR 1 and Proposed US 301 Connector Toll Road	29	28	62
		Saving via US 301 Connector Toll Road	6	27	

[A] Peak Period Times
For US 301 Connector Toll Road, used 2015 AM Peak Network

In 2005 and 2010, RK&K conducted comparative travel time runs for through trips in the extended Northeast Corridor region in the two corridors — I-95 via Baltimore and US 301 via the Chesapeake Bay Bridge. The results listed in Table 3-7 compare a trip movement between the northerly decision point at I-95/SR 1 and the southerly decision point at I-95/I-495/US 50 along the Capital Beltway east of Washington, D.C. Also shown are the relative tolls at the time of the travel time runs were performed. Note that tolls are significantly higher via I-95, which is an inducement for some motorists and particularly truckers to use the US 301/Chesapeake Bay Bridge routing.

Table 3-7
Northeast Corridor Comparative Travel Times, Distances, and Tolls

Route End Points	Year and Conditions[A]	Route	Distance (Miles)	Time[A] (Min.)	Speed (MPH)	Tolls[B]	
						2-axle	5-axle
SR-1/I-95 & I-95/I-495/US 50	2005 Average Conditions	Via US 301 & US 50	104	117	53	$2.50	$10.00
		Via I-95 Through Baltimore	98	104	57	$10.00	$36.00
		Saving via I-95	6	13		-$7.50	-$26.00
SR-1/I-95 & I-95/I-495/US 50	2010 A.M. Peak Southbound	Via US 301 & US 50	104	114	55	$2.50	$15.00
		Via I-95 Through Baltimore	98	119	49	$11.00	$51.00
		Saving via I-95	6	-5		-$8.50	-$36.00
SR-1/I-95 & I-95/I-495/US 50	2010 P.M. Peak Northbound	Via US 301 & US 50	104	115	54	$2.50	$15.00
		Via I-95 Through Baltimore	98	107	55	$11.00	$51.00
		Saving via I-95	6	8		-$8.50	-$36.00

(A) 2005 Data includes data from all periods of day, 2010 data includes peak period in peak direction.
(B) Tolls reflect toll rates in the year the data was collected.

The travel times for 2005 in Tables 3-7 represent an average of six runs in each direction on two weekdays in June 2005 during morning, mid-day, and evening periods, with half of the runs at the posted speed limit and the other half at the prevailing traffic speeds. On US 301, the travel times shown in Table 3-7 ranged from 109 to 128 minutes, averaging 117 minutes; while on I-95 the range was much broader: from 93 to 125 minutes depending on Baltimore/Washington traffic conditions, averaging 104 minutes. Note that the US 301 routing is six miles longer than the I-95 route. Generally, the I-95 routing is both shorter and faster by approximately 13 minutes, but this route does include significant additional toll costs.

In 2010, the travel time runs were repeated with largely similar results where the I-95 routing was generally 15 minutes faster than the times using the existing US 301 alignment during the off peak and non-peak directions of travel. During the peak periods in the peak direction, congestion in the southbound direction during the a.m. peak on I-95 results in this route being approximately five minutes longer than the US 301 route. During the p.m. peak, I-95 is only eight minutes faster than US 301.

It is significant to note that the US 301 travel times in Table 3-6 were recorded on existing US 301 in Delaware. If the new toll road was in existence now, the US 301 Mainline project would likely reduce approximately 12 minutes off the present 117 minutes, reducing the US 301 travel time to 105 minutes, and increasing this route's average speed to 60 mph (approximately the same observed speed on the I-95 routing).

On October 2008, Stantec staff also conducted a series of travel speed runs along US 301 and the local parallel routes within the corridor. RK&K also performed additional travel time runs for these local routes in November 2010. Figure 3-1 displays the locations of the latest speed run data for five local roadways. The data were used to establish current travel speeds and were compared to previous data gathered during prior studies. This survey was performed in both peak and off-peak conditions and these data were collected via multiple trials. The travel conditions were averaged to provide estimates of typical travel speeds through the corridor.

As listed in Table 3-8, Corridor 1 (US 301 Corridor via Summit Bridge) has only a minor variation in travel time by direction and time of day. The lack of variation in travel time is a result of recent widening and other improvements to the alignment south of Middletown. The other local corridors exhibit minor variations in travel times and speeds. Route 299 between US 301 and SR 1 does show congestion in the peak periods. Corridor 5 (MD 213) has an average speed of approximately 44 mph, which reflects a combination of low speeds near the small towns of Galena, Georgetown and Cecilton, with the remaining sections having a higher speed limit at 55 mph. Note that these data are used as part of the model calibration data set to ensure reasonable travel speeds for the local competing facilities.

Figure 3-1
Local Corridors for Speed / Travel Time Data

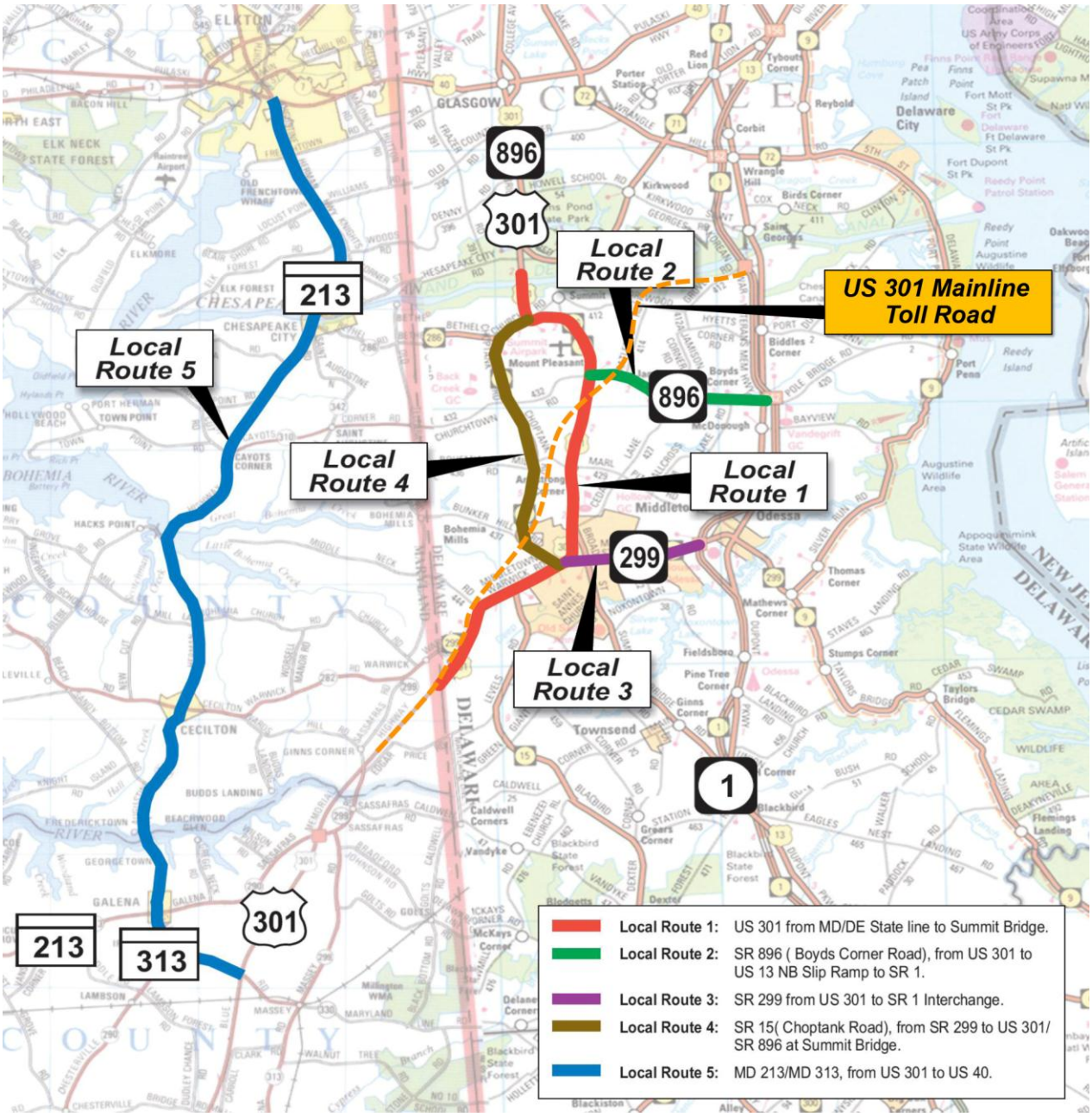


Table 3-8
Speed Summary for US 301 and Parallel Routes

Corridor Description and Direction		Distance (mile)	Travel Times and Speed by Period					
			AM Peak		PM Peak		Off Peak	
			Travel Time (min)	Speed (mph)	Travel Time (min)	Speed (mph)	Travel Time (min)	Speed (mph)
1. US 301 Local from MD/DE Stateline to Summit Bridge	NB	11.0	15.0	44.0	15.0	44.0	15.0	44.0
	SB	11.0	14.0	47.1	14.0	47.1	14.0	47.1
2. Route 896 from US 301 to SR 1 via US 13 NB slip ramp	EB	6.0	9.0	40.0	10.0	36.0	9.0	40.0
	WB	6.0	8.0	45.0	8.0	45.0	8.0	45.0
3. Route 299 from US 301 to SR 1	EB	3.0	6.0	30.0	7.0	25.7	6.0	30.0
	WB	3.0	8.0	22.5	7.0	25.7	8.0	22.5
4. Choptank Road from US 301/RT 299 to US 301	NB	9.0	15.0	36.0	17.0	31.8	15.0	36.0
	SB	9.0	13.0	41.5	13.0	41.5	13.0	41.5
5. MD 213/MD 313 from US 301 to US 40	NB	22.0	30.0	44.0	30.0	44.0	30.0	44.0
	SB	22.0	30.0	44.0	31.0	42.6	30.0	44.0

3.4 Origin-Destination Survey

Two roadside traffic surveys were conducted by RK&K in 2005 and 2011 to identify the travel patterns of auto and truck traffic on existing US 301. In 2005, RK&K interviewed truck traffic using the truck stop on US 301 just east of the Maryland state line as well as auto traffic at the signalized intersections at SR 299. In 2011, RK&K interviewed traffic on US 301 in the vicinity of the proposed mainline toll plaza to update the earlier findings of the 2005 survey. Northbound passenger car and truck traffic was diverted to a weigh station along US 301 just north of the Maryland/Delaware state line to be interviewed on Tuesday, August 2, 2011, between 7 AM and 8 PM.

The results of the 2011 survey were expanded to be representative of traffic patterns in the corridor on a typical weekday in 2009, the base year for the DelDOT Regional Transportation Model, and used to calibrate the model. Information obtained for each vehicle in the survey included:

- Time of interview (to indicate if trip was made during peak or off-peak period);
- Vehicle class (passenger cars, motorcycles, trucks by number of axles);
- Trip origin
- Trip destination;
- Trip frequency;
- One-way or round trip;
- Return route, if round trip;
- Trip purpose;
- Whether or not motorist had an E-ZPass account; and
- Whether or not motorist used the Bay Bridge for this trip.

A total of 1,994 interviews were obtained, representing 54.8 percent of the total 3,642 northbound vehicles passing the survey location during the survey hours and 38.7 percent of the total northbound traffic on the full 24-hour day. Of the total 2,824 passenger cars passing the station, 1,672, or 59.2 percent, were interviewed and 304 or 38.8 percent of the total 784 trucks were interviewed. Of the 24-hour volume at the site, 45.7 percent of the passenger cars and 21.7 percent of the trucks were interviewed. The number of vehicles passing the survey station on the survey day, during the survey hours, the number of interviews, and the percent interviewed, by vehicle class, are shown in Table 3-9:

Table 3-9
Northbound Traffic and Survey Sample Statistics

Vehicle Class	Number of Vehicles			Percent Interviewed	
	Full Day	During Survey Hours	Interviewed	Of Full Day	During Survey Hours
Passenger Cars	3695	2,824	1,687	45.7%	59.7%
Trucks					
2-axle, 6-tire	301	242	63	20.8%	25.9%
3-axle	52	39	20	39.2%	52.4%
4-axle	23	17	9	41.1%	56.0%
5-axle	1,009	466	206	20.4%	44.2%
6-axle	30	21	9	30.3%	43.2%
Subtotal	1,414	784	307	21.7%	39.1%
Buses	49	34			
Total	5,158	3,642	1,994	38.7%	54.8%

To geocode the origin and destination data, all origins and destinations were originally coded to the zip code level and then compressed into 11 larger geographic districts to facilitate discussion of the travel patterns. The districts, shown in Table 3-10 and Figure 3-2, were developed based on an aggregation of the Transportation Analysis Zones (TAZs) in the regional transportation model used for forecasting US 301 Mainline Toll Road traffic. Six of these districts are “internal”, which are located within the immediate area of the project and the source of local or intermediate distance trips. The remaining five districts are “external” districts which encompass regions outside of the modeled area and are the source of longer distance trips. Note that these external districts at the northern end of the study area represent the ‘gateways’ to the larger metropolitan areas of Philadelphia (via I-95) and northern New Jersey, New York City, and points beyond. At the southern end of the study area, the principal external zone is the Chesapeake Bay Bridge where trips enter the modeled region from the western shore counties of Maryland, Washington D.C and locations further south.

Table 3-10
Geographic Origin/Destination Districts

District	Name	Type
1	Bay Bridge	External
2	US-13, MD (Southern external)	External
3	Eastern Shore Maryland (Cecil, Kent, Queen Anne, Talbot, Caroline Counties)	Internal
4	Maryland Others - Southern Internal Zones	Internal
5	Kent & Sussex Counties, DE	Internal
6	New Castle County - South of Canal	Internal
7	New Castle County - North of Canal	Internal
8	New Castle County - Wilmington Area	Internal
9	I-95 at PA/Delaware State Line	External
10	I-295 Delaware Memorial Bridge	External
11	Other Northern External Roadways	External

Based on the location of the origin and destination, a trip can be short or intermediate distance trips with both ends within the modeled area that encompasses the US 301 Toll Road (internal-internal trips), intermediate distance trips with one end in the immediate study area and the other end outside the area (internal-external or external-internal trips), or long-distance trips with both trip ends outside the area covered by the regional transportation model (external-external trips).

The external districts represent entry points or “gateways” where trips from various remote origins and destinations enter and exit the area encompassed in the regional model. On the southern end, the Bay Bridge external zone represents origin of northbound trips from western shore of Maryland, Washington D.C., Virginia, Florida and other southern states that would enter into the study area via the Chesapeake Bay Bridge. Similarly on the northern end of the study area the I-95 and I-295 external districts represent exiting roadways are gateways for trips to locations in Pennsylvania, New Jersey, New York and New England. District 11 includes other northern external roadways, such as US 202 at the Pennsylvania state line that serve as gateways for areas to the suburban Philadelphia west of the city.

Table 3-11 provides an initial summary of the surveyed trips by vehicle type aggregated into categories with respect to the modeled region. Internal trips are movements that both begin and end inside of the modeled region, while external-internal trips have either the origin or the destination outside of the modeled region. The final category, external-external trips, represents through traffic that is passing directly through the region. As expected, the majority of the auto trips (56 percent) are internal movements inside the modeled area. In contrast approximately 80 percent of the truck trips have at least one or both ends of their trips outside of the modeled area.

Figure 3-2
Geographic Origin/Destination Districts

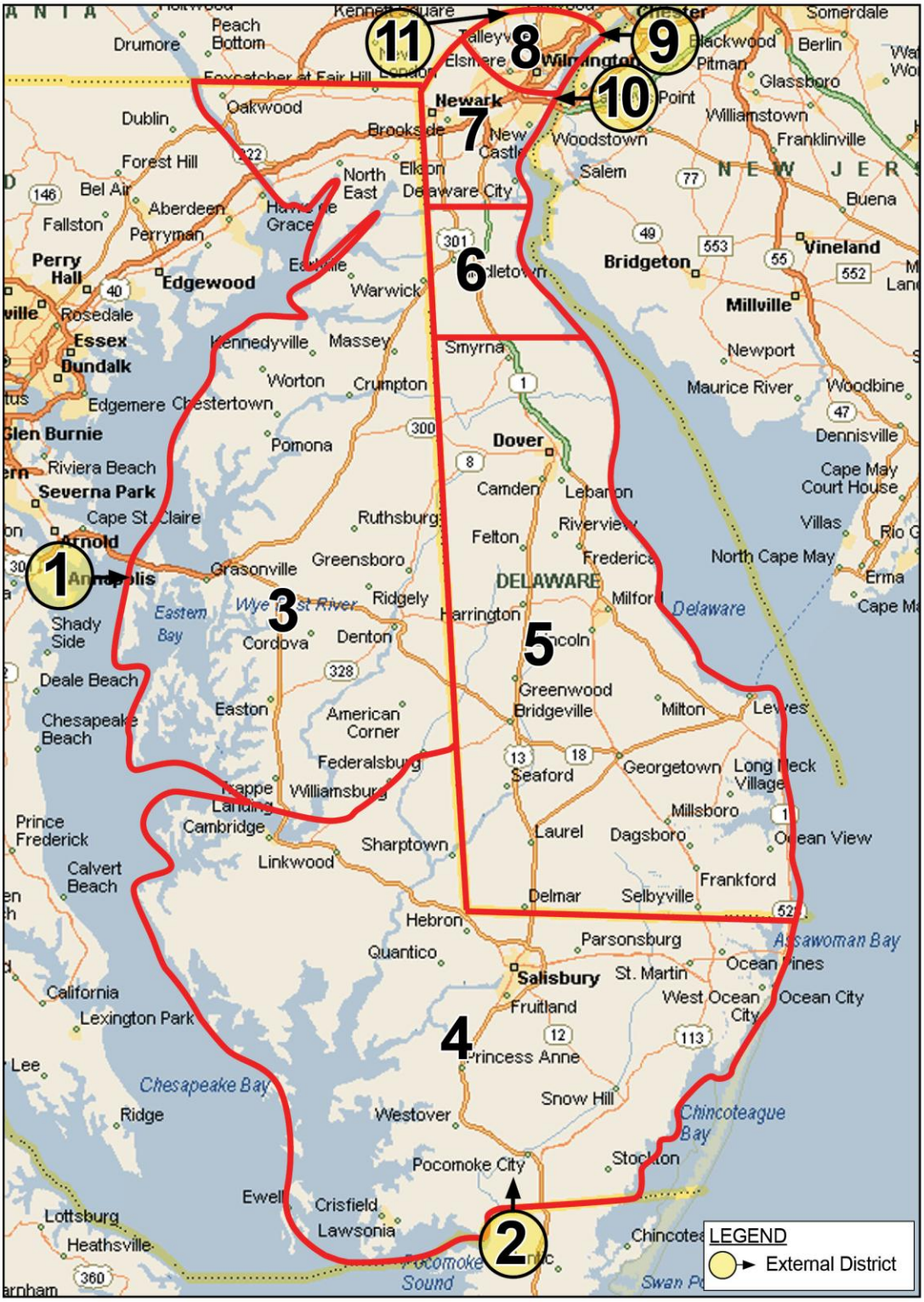


Table 3-11
Trips by Movement Type

Type of Trip	Passenger Cars		Trucks	
	Number	Percent	Number	Percent
Internal-External, External-Internal	1,139	27.1%	306	25.5%
Internal-Internal	2,382	56.7%	238	19.8%
External-External	678	16.1%	656	54.7%
Total	4,199	100.0%	1,200	100.0%

Table 3-12 provides a further disaggregation of the survey data by individual origin and destination districts. The states accounting for most of the trip origins are Maryland, and Virginia. For passenger cars, 81 percent of the trips were from Maryland: 67 percent of the trips had origins in the Eastern Shore counties and remaining 14 percent had origins on the west of the Chesapeake Bay and entered the area via the Bay Bridge. Another 4 percent began in Virginia. For trucks, the major portion of the trips also had origins in Maryland: 28 percent of the trips began in the Eastern Shore and 21 percent came across the Bay Bridge. Another 21 percent began in Virginia. The wide range of trip origins indicates that many of the trips are not local in nature.

Table 3-12
Trip Origins and Destinations

Trip Origins		
Location	**Passenger Cars**	**Trucks**
Delaware - New Castle County, South of C&D Canal	4.5%	0.3%
Delaware - Kent & Sussex Counties	3.7%	2.9%
Maryland - Via Bay Bridge	14.6%	21.1%
Maryland - Eastern Shore	64.5%	25.5%
Maryland - South Eastern Shore	2.2%	3.5%
Virginia	4.4%	21.2%
Others	6.2%	25.5%
Totals	**100.0%**	**100.0%**

Trip Destinations		
Location	**Passenger Cars**	**Trucks**
Delaware - Wilmington Area	7.1%	7.0%
Delaware - North of Canal	16.1%	10.1%
Delaware - South of Canal	40.3%	12.4%
Pennsylvania	14.6%	20.5%
New Jersey	12.1%	28.1%
New York	4.5%	9.0%
Others	5.3%	13.0%
Total	**100.0%**	**100.0%**

Delaware has the highest number of trip destinations, with 64 percent of the passenger car trip destinations and one-third of the truck destinations. Of the passenger cars, 40 percent are going south of the C&D Canal and 16 percent are going to New Castle County, between the Canal and the Wilmington area. Other major destinations for passenger cars are Pennsylvania (14 percent), New Jersey (12 percent) and New York (4 percent). For trucks, trip destinations are more evenly distributed with 26 percent going to New Jersey and 22 percent going to Pennsylvania. The truck trips to Delaware are distributed largely throughout the New Castle County. As can be seen from the distributions of trip origins and destinations many of the trips are long distance and US 301 provides a logical alternative to the traveling on I-95 through the congested Baltimore Area.

Table 3-13 is a matrix showing the number of trips by district-to-district movement for passenger cars and trucks. As anticipated, the majority of the auto traffic is internal trips between the Maryland Eastern Shore counties and New Castle County. Of the 4,199 passenger car trips on an average weekday, 2,382, or 57 percent, have both ends located in internal districts. The largest movement measured during the survey, with 1,288 daily trips, is between the Eastern Shore of Maryland bordering Chesapeake Bay and New Castle County south of the C&D Canal (which includes the Middletown area). Other large internally-oriented movements are trips between these same Maryland counties and locations north of the Canal and the Wilmington area which together account for 700 auto trips (479 and 221). Note that these trips are effectively "pass through" trips and would likely use the US 301 Mainline Toll Road to bypass local traffic in Middletown.

There are 1,139, or 27 percent of the total trips, with one end in an internal district and the other end outside the modeled study area. Most of these trips are between the Eastern Shore of Maryland and I-295, I-95 and other northern external zones. Since US 301 provides the best approach to northeastern U.S. for trips from the Eastern Shore, these trips are likely to continue to use the US 301 route.

Of all auto trips intercepted at the survey point on the state line, 16.2 percent are external-external movements passing completely through the study area, and represent longer distance trips traveling through to the northeastern U.S. via I-95 or I-295. The long-distance trip between the Chesapeake Bay Bridge and I-295 at the Delaware Memorial Bridge and points beyond is the third highest volume trip representing 10.3 percent of the total passenger car trips on an average weekday. These trips, and other trips between the Chesapeake Bay Bridge and northern external zones such as I-95 and US 202 into Pennsylvania, are likely to continue to take the US 301 route to avoid the congestion in the Baltimore area and on I-95 in Maryland.

The largest concentration of truck trips are longer distance movements not destined to the Middletown area, but instead traveling through to other destinations and likely to continue to use US 301 to avoid local traffic. Of all trips, 55 percent are between two external zones. The highest volume truck trip is between the Chesapeake Bay Bridge and I-295 at the Delaware Memorial Bridge, with 471 trips per day. This accounts for 39.2 percent of all truck trips. The second largest truck trip movement, between the Chesapeake Bay Bridge and I-95 at the Delaware/Pennsylvania State Line, is also a long-distance trip. On an average weekday, there are 145 truck trips or 12.1 percent of total truck traffic making this trip. As noted above, these trips are now avoiding I-95 and are therefore likely to remain on US 301 and therefore utilize the proposed toll road.

Table 3-13
Survey District-to-District Trip Movements

Autos

	Zone - to - Zone	Eastern Shore Maryland	Kent and Sussex Counties, DE	New Castle County - South of Canal	New Castle County - North of Canal	New Castle County - Wilmington Area	I-95 at Delaware/PA Stateline	I-295 at Delaware Memorial Bridge	Northern External	All Trips
		3	5	6	7	8	9	10	11	
1	Chesapeake Bay Bridge	7	3	164	123	69	203	434	23	1,026
2	US 13, MD	4		4	2		2	16		28
3	Eastern Shore Maryland	29		1,288	479	221	296	322	76	2,711
4	Maryland - Southern	6		5	16	5	28	26	8	94
5	Kent and Sussex Counties, DE	18		106	24			3	2	153
6	New Castle County - South of Canal	15		130	35	5		2		187
	All Trips	79	3	1,697	679	300	529	803	109	4,199

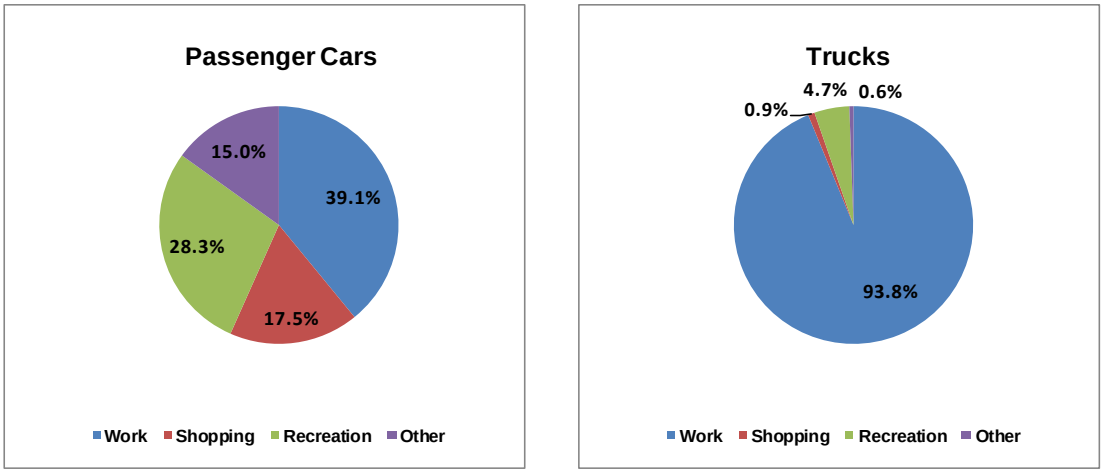
Trucks

	Zone - to - Zone	Eastern Shore Maryland	Kent and Sussex Counties, DE	New Castle County - South of Canal	New Castle County - North of Canal	New Castle County - Wilmington Area	I-95 at Delaware/PA Stateline	I-295 at Delaware Memorial Bridge	Northern External	All Trips
		3	5	6	7	8	9	10	11	
1	Chesapeake Bay Bridge	4	4	45	43	52	145	471	25	789
2	US 13, MD							15		15
3	Eastern Shore Maryland	3	3	86	75	26	55	53	20	321
4	Maryland - Southern	7		4	3	8		7	7	36
5	Kent and Sussex Counties, DE			15	4		11	5		35
6	New Castle County - South of Canal			4						4
	All Trips	14	7	154	125	86	211	551	52	1,200

Type of Trip:
- Internal-External, External-Internal
- Internal - Internal
- External -External

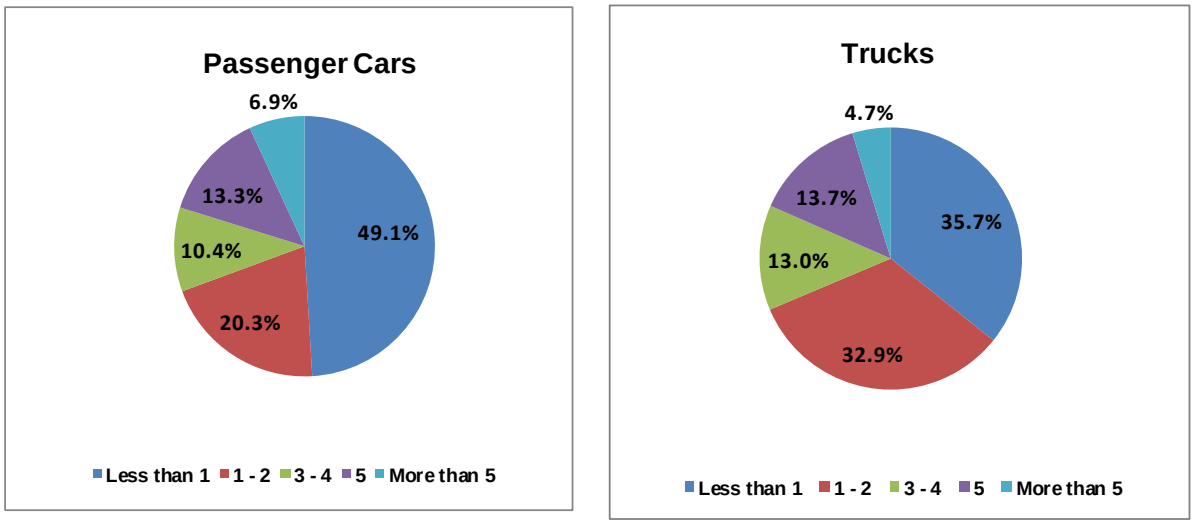
Additional data obtained during the survey provided information on trip purpose, trip frequency, use of the Chesapeake Bay Bridge and route used for reverse trip. Regarding trip purpose, 39.1 percent of the trips by passenger cars are for business, which includes both commuter and other types of business trips, such as attending meetings. Recreational trips accounted for 28.3 percent of passenger car trips and shopping was given as a response by 17.5 percent of the motorists. “Other” accounted for the remaining 15.0 percent of the trips. Approximately 94 percent of the truck trips are for business purposes. The trip purpose is shown graphically for passenger cars and trucks in Figure 3-3.

Figure 3-3
Trip Purpose



With regard to trip frequency, approximately 70 percent of the passenger car trips are made less than three times per week, indicating infrequent users. This is consistent with the relatively large percent of long distance trips using US 301. Another 10 percent make the trip three to four times per week and 20 percent of the trips are made five days a week or more frequently. Of the truck trips, 36 percent are made less than once a week, typical of long- haul truck movements. A total of 18 percent of the truck trips are made five days a week or more. These are delivery vehicles with regular routes, primarily short distance local trips. Trip frequency for passenger cars and trucks is shown in Figure 3-4.

Figure 3-4
Trip Frequency



It should be noted that infrequent trip users are less likely to be knowledgeable about other local non-tolled roadways that are in the vicinity of the toll road and would not be likely to divert off of the US 301 Mainline Toll Road.

The distribution of trip frequency by trip purpose presented in Table 3-14 shows that more than half of the passenger car work trips are frequent; i.e., three or more times per week. Shopping, recreational and "other" trips are primarily non-frequent. Approximately 70 percent of the shopping trips, 90 percent of the recreational trips and 80 percent of the "other" trips are made less than three times per week.

Table 3-14
Trip Frequency by Purpose

Times per Week	Passenger Cars				
	Work	Shopping	Recreation	Other	Total
Less than once	31.1%	37.8%	74.1%	61.6%	49.1%
1 - 2	16.9%	32.0%	18.2%	19.6%	20.3%
3 - 4	10.8%	19.7%	4.5%	9.8%	10.4%
5	27.6%	5.8%	2.0%	6.0%	13.3%
More than 5	13.6%	4.6%	1.2%	3.0%	6.9%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

During the survey, motorists were asked whether or not they used the same route; i.e., US 301, for the return trip. The results are presented in Table 3-15

Table 3-15
Return Route

Type of Trip	Passenger Cars	Trucks
Round Trips		
Using US 301	77.8%	64.7%
Not using US 301	12.6%	23.4%
One-Way Trips	9.6%	11.9%
Total	100.0%	100.0%

The motorists interviewed were making the northbound trip. As shown in the table, approximately 90 percent of both the passenger car and truck trips are round trips. Of the total trips, 12.6 percent of the passenger cars and 23.4 percent of the trucks are using an alternative route for the return trip. This is to be expected since the competing parallel I-95 route is less costly in the southbound direction due to one-way northbound toll collection on the Maryland Turnpike. A higher percent of trucks is using the alternative for their reverse route since trucks have a higher sensitivity to tolls than passenger cars.

An additional question asked during the survey was whether or not the motorist used the Chesapeake Bay Bridge as part of the trip. As shown In Table 3-16, 24.1 percent of the passenger cars and 67.7 percent of the trucks used the bridge. These results are similar to the information presented in the district-to-district trip movements presented in Table 3-13.

Table 3-16
Trips Crossing the Chesapeake Bay Bridge

	Passenger Cars	Trucks
Trips Crossing Chesapeake Bay Bridge	24.1%	67.7%
Trips Not Crossing Chesapeake Bay Bridge	75.9%	32.3%
Total Trips	100.0%	100.0%

As an extension of the district-based travel patterns discussed previously, Stantec estimated the travel distances that the various surveyed trips traversed *within the modeled region*. The analysis of trip length provides further insight into the characteristics of these trips and the coupled with the trip frequency data provides an indication as to the likelihood of these trips diverting away from US 301 when tolls are implemented.

Trip distance within the modeled region was estimated using the distances between traffic analysis zones that were representative of general origins and destinations in each of the zip code districts. Note that the distances discussed in the following tables are the values for the portion of trip movements that are within the modeled areas and as such do not reflect that actual ” total” distances for long distance trips that extend beyond the modeled region. As an example a trip from Washington D.C to Philadelphia via the Bay Bridge would be listed as in the tables as 91 miles which includes only the modeled distance from the Bay Bridge to the I-95 external zone at the Pennsylvania state line. Depending on the actual origins and destinations, long-haul trips such as this example can be several hundred miles in actual length and as such extend well beyond the modeled study area.

The modeled-area distances for district-to-district trips is shown in Table 3-17. The longest trips are those from the south via US 13 due to the distance from the survey station to the external decision point. With the exception of some trips within Delaware, all trips are more than 25 miles in distance. As noted above these distances include only the trip length within the modeled area. Therefore, the distances for all trips that are externally-related are significantly longer when including the additional segments of the trip to the actual external origins and external destinations beyond the study area boundary.

Table 3-17
District-to-District Trip Length
(miles)

Zone - to - Zone		Eastern Shore Maryland	Kent and Sussex Counties, DE	New Castle County - South of Canal	New Castle County - North of Canal	New Castle County - Wilmington Area	I-95 at Delaware/PA Stateline	I-295 at Delaware Memorial Bridge	Northern External
		3	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	Chesapeake Bay Bridge	68	54	58	75	83	91	80	87
2	US 13, MD	153		115	132		144	134	
3	Eastern Shore Maryland	46		26	48	60	76	71	72
4	Maryland - Southern	113		79	93	100	109	97	105
5	Kent and Sussex Counties, DE	54		22	38			63	39
6	New Castle County - South of Canal			8	22	25		27	

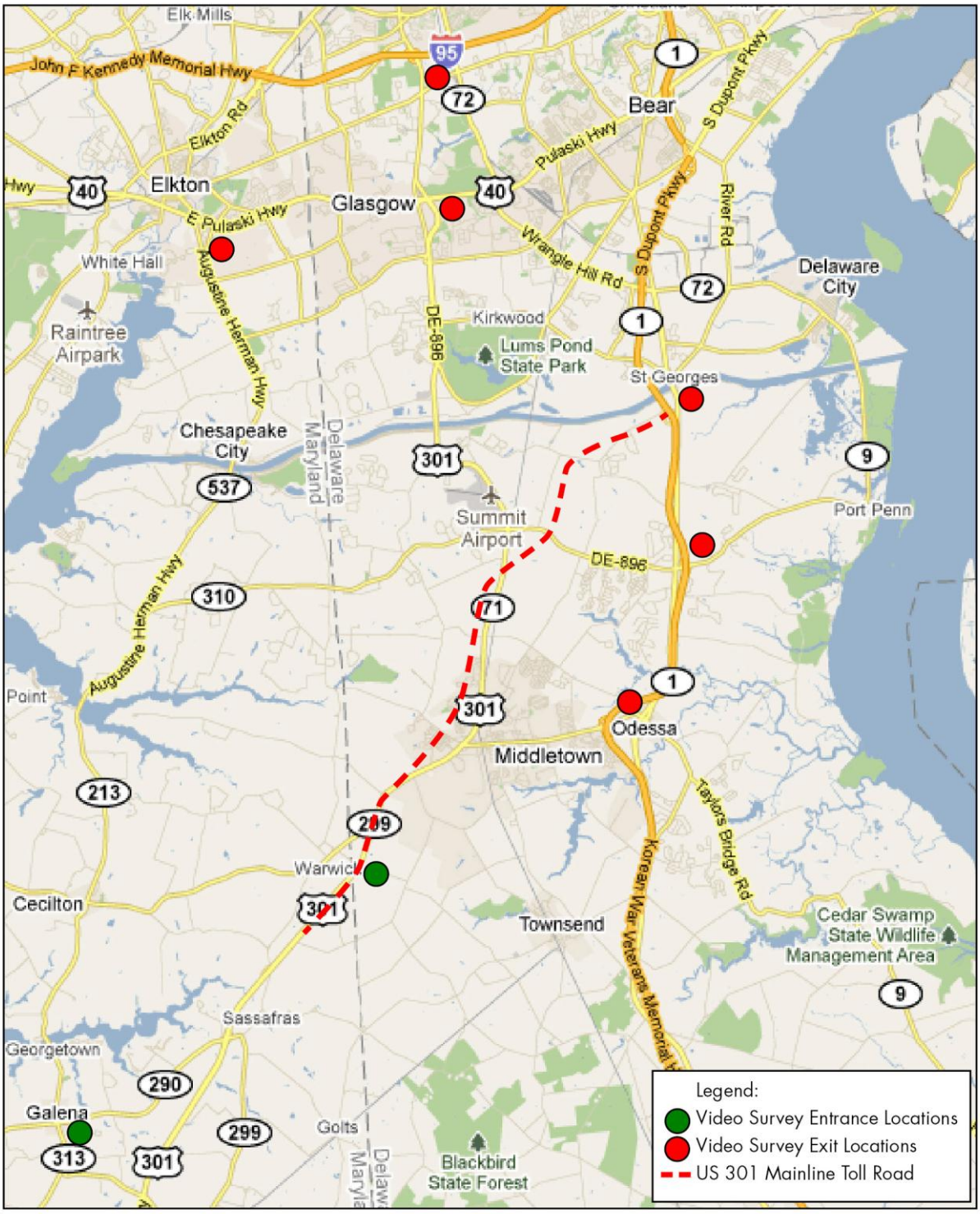
Type of Trip:
- Internal-External, External-Internal
- Internal - Internal
- External -External

3.5 Traffic Routing Survey

In September 2008, Stantec staff, in conjunction with our subconsultant Alliance Transportation Group (ATG), collected video license plate data at selected locations in corridor in order to verify the routing of long-distance trips. The purpose of this survey was to gather additional information related to the exact routing of trips through the Middletown area and quantify through movements on MD 213. The survey also provides some indication of the percentage of vehicles that are utilizing toll roads in the Middletown region, based on their access to SR 1 south of the Biddles Toll Plaza.

Within Delaware, the license plate data were obtained in the northbound/eastbound direction for a 12-hour (daylight) period for the locations displayed in Figure 3-5. Note that the two locations where northbound traffic entered the video survey area are shown as green points. The first set of six video locations focused on trips that entered Delaware on US 301. The precise descriptions of these six locations are as follows:

Figure 3-5
Video Survey Locations



1) US 301 NB at the Delaware State Line
2) SR 299 on-ramp to NB SR 1
3) SR 896 on-ramp to NB SR 1
4) US 13 south of C&D Canal on-ramp to NB SR 1
5) SR 896 NB exclusive turn lane to EB US 40
6) SR 896 NB ramp to NB I-95

The data from these six locations were used to quantify long-distance trips and identify their routing through the corridor. Location 1 (US 301 NB at the state line) captures all trips that traveling through (or destined within) Middletown, Delaware. The remaining five locations capture these vehicles as they continue their trip north of Middletown onto major facilities. Note that locations 2 and 3 indicate trips that will encounter a toll charge since these trips access SR 1 northbound south of the Biddles Toll Plaza. Locations 4, 5, and 6 will not incur toll charges as they pass through the Middletown area.

Two additional locations were collected in Maryland on MD 313 north of US 301 and MD 213 south of US 40. Data from these two locations were used to quantify the percentage of trips using this roadway for through movements between US 301 and US 40 within Maryland.

Table 3-18 summarizes the travel patterns by vehicle type from the license plate survey. The percentages are given only for the vehicles passing two origin-destination survey stations. Accordingly, only 34.3% of total trips on US 301 at state line passed through one of the destination stations, and the remaining 65.7% of the trips used different routes or travelled locally without crossing the C&D Canal.

Table 3-18
Summary of License Plate Survey

Origin Station	Destination Station	Day Time		
		Auto	Truck	Total
US 301 NB at State Line	SR 1 NB on Ramp from SR 299	9.7%	1.3%	7.7%
	SR 1 NB on Ramp from SR 896	2.3%	6.6%	3.3%
	SR 1 NB on Ramp from US 13 NB	6.7%	21.5%	10.2%
	US 40 EB from SR 896 NB	3.1%	1.6%	2.7%
	I-95 NB on Ramp from SR 896 NB	9.3%	13.7%	10.4%
	Sum	31.1%	44.8%	34.3%
MD 313 NB at W of US 301	MD 213 NB at S. of Whitehall Rd.	1.5%	12.4%	3.6%

The longer-distance trips traveling northbound on US 301 at the Delaware State Line have to utilize one of several bridges serving US 301/SR 896, SR 1, or US 13 in order to cross the C&D Canal. From the survey data approximately 60 percent (21.2% of 34.3%) of these long distance trips used SR 1, and remaining 40 percent (13.1% of 34.3%) used US 301/ SR 896.

The long-distance truck trips travelling northbound from US 301 can access SR 1 at three interchange entrances, SR 299 (Interchange 136), SR 896 (Interchange 142), and US 13 (Interchange 148). Trucks entering SR1 from SR 299 and SR 896 pay tolls at the Biddles Toll Plaza. Note that SR 299, which is Main Street in Middletown, has a prohibition of trucks with 3 or more axles which explain the lower percentage of truck trips versus auto trips using this interchange. Approximately 73 percent of the trucks accessing SR 1 part of their trip use the non-tolled interchange from northbound US 13. Note that approximately 30 percent of the northbound US 301 truck trips access I-95 from SR 896/US 301 via the Summit Bridge which is also a non-tolled movement. Since long-distance trips tend to be less sensitive to tolls, the choices exhibited by these trips indicate the current time savings for the limited section of SR 1 that is tolled south of the Canal do not provide a significant enough benefit to select the tolled route.

The two additional locations in Maryland were used to quantify the usage of long-distance travel on MD 213. Northbound traffic was intercepted on MD 313 just north of US 301 prior to the intersection of MD 313 and MD 213. Traffic captured from this location was compared to northbound vehicles on MD 213 just south of US 40 near Elkton, Maryland. As anticipated the percentage of auto trips traveling this entire distance (1.5 percent) is minimal compared to the percentage of truck trips that travel this section of MD 213. While MD 213 is not currently competing with US 301, the implementation of tolls on US 301 and the truck prohibitions on adjacent roadways that parallel the US 301 Mainline Toll Road may increase the attractiveness of MD 213 for long-distance truck traffic. As noted previously, the speed restrictions and signalization through several small towns along MD 213 will tend to limit the attractiveness of this route as a non-tolled alternative.

4 MODELING METHODOLOGY

This chapter describes the overall modeling methodology as well as various enhancements implemented to develop the final modeling process. These enhancements included the introduction of a customized toll diversion process, which was used to forecast demand for the existing toll facilities as well as the US 301 Mainline Toll Road.

4.1 Modeling Methodology and Enhancements

The modeling methodology adopted for this project used two separate modeling procedures. The first procedure was the DelDOT Regional Model (also known as the Peninsula model) which was used to develop estimates of overall travel flows in the form of vehicle trip tables for the region. This model forecasts travel for Delaware and includes portions of Maryland as shown in Figure 4-1. The second procedure was a customized assignment process developed by Stantec to estimate toll diversion and traffic assignment. This procedure provided estimates of both peak period and daily toll traffic for this project. In addition to these models, Stantec also obtained the Baltimore Metropolitan Council's (BMC) regional model network and trip tables to assist in abstracting travel west of the DelDOT regional model.

Stantec obtained the latest available 2008 base year and 2040 future year data sets for the regional model from the DelDOT. As an initial step Stantec executed the regional model with a revised 2009 socioeconomic data set prepared for this project, as described in Chapter 5. The resulting trip tables were then used as inputs to the customized toll diversion model that performs the highway assignment and the toll diversion model was then calibrated to replicate traffic for all roadways in the corridor. The toll diversion model developed traffic forecasts for four distinct time periods (AM peak, mid-day, PM peak, and night. This was essential for estimating toll diversion that is influenced by traffic congestion which varies significantly by time period. The toll diversion model includes a specialized assignment process that performs toll diversion using a binary logit model as described later in Section 4.3.

Once the model was calibrated, Stantec prepared model data sets for horizon years at 5-year intervals from 2015 to 2040. This effort included updated socioeconomic forecasts at 5-year intervals from 2010 through 2040, as prepared by our subconsultant ATG. The development of these revised forecasts is discussed in detail in Chapter 5. Stantec then executed the regional model and the toll diversion model to prepare traffic and revenue forecasts for the entire horizon year period.

4.1.1 Regional Model Zonal System

The current version of the DelDOT Regional Model has 2136 traffic analysis zones of which approximately 1000 are reserved for future use. The zones for each county are listed in Table 4-1. This zone structure was retained for this project as the scale of the zones was acceptable for the toll diversion analysis. Figure 4-1 shows the county map of the study region as listed in Table 4-1. Figure 4-2 shows the zonal boundary in the US 301 project area.

Table 4-1
Zonal System in DelDOT Regional Model

State	County	Zones
Delaware	New Castle	1-345
	Kent	623-780
	Sussex	1081-1307
Maryland	Cecil	1608-1695
	Kent	1696-1715
	Queen Anne's	1716-1737
	Caroline	1738-1744
	Talbot	1745-1753
	Others	1754-1849
External Zones		2109-2136
Zones Reserved for Future Use		346-622, 781-1080, 1308-1607, 1850-2108

4.1.2 Network Enhancements

As part of the model development effort, several enhancements were made to the highway networks used in the regional model and the toll diversion model. The DelDOT regional model utilizes a master highway network including the future improvement projects as well as the US 301 Mainline Toll Road. Stantec utilized this network for the toll diversion model and implemented several improvements for the diversion analysis. These enhancements included the bifurcation of SR 1 and the detailed abstraction of toll rates and discount policies at each toll plaza. Stantec then reviewed the enhanced network to ensure the proper coding of various roadways. The number of lanes and speed limits were also verified to replicate the travel patterns in each major corridor. As a final step the network was processed with several procedures to assess the reasonableness of paths and verify basic network symmetry.

Figure 4-1
County Map of the Study Region

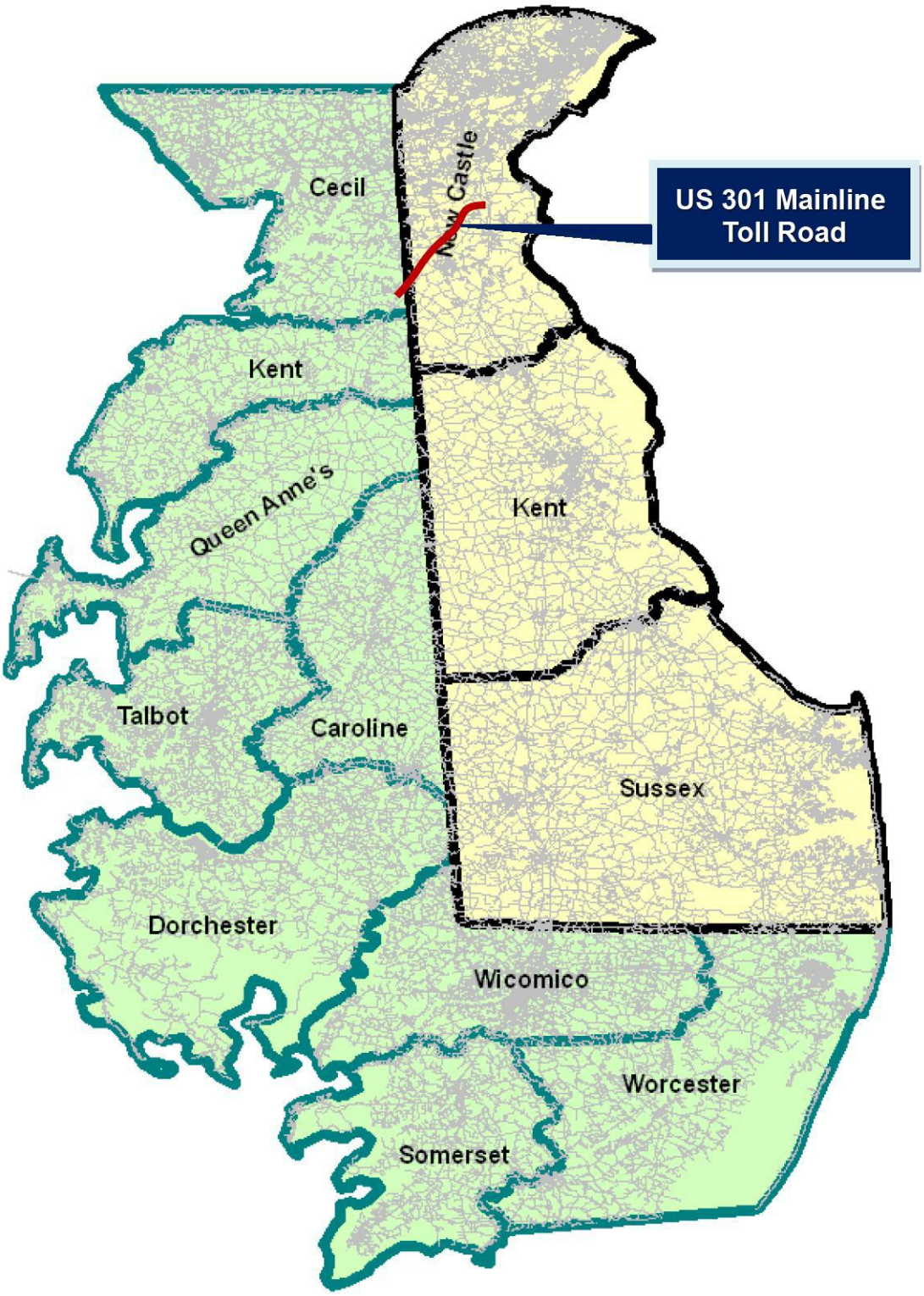
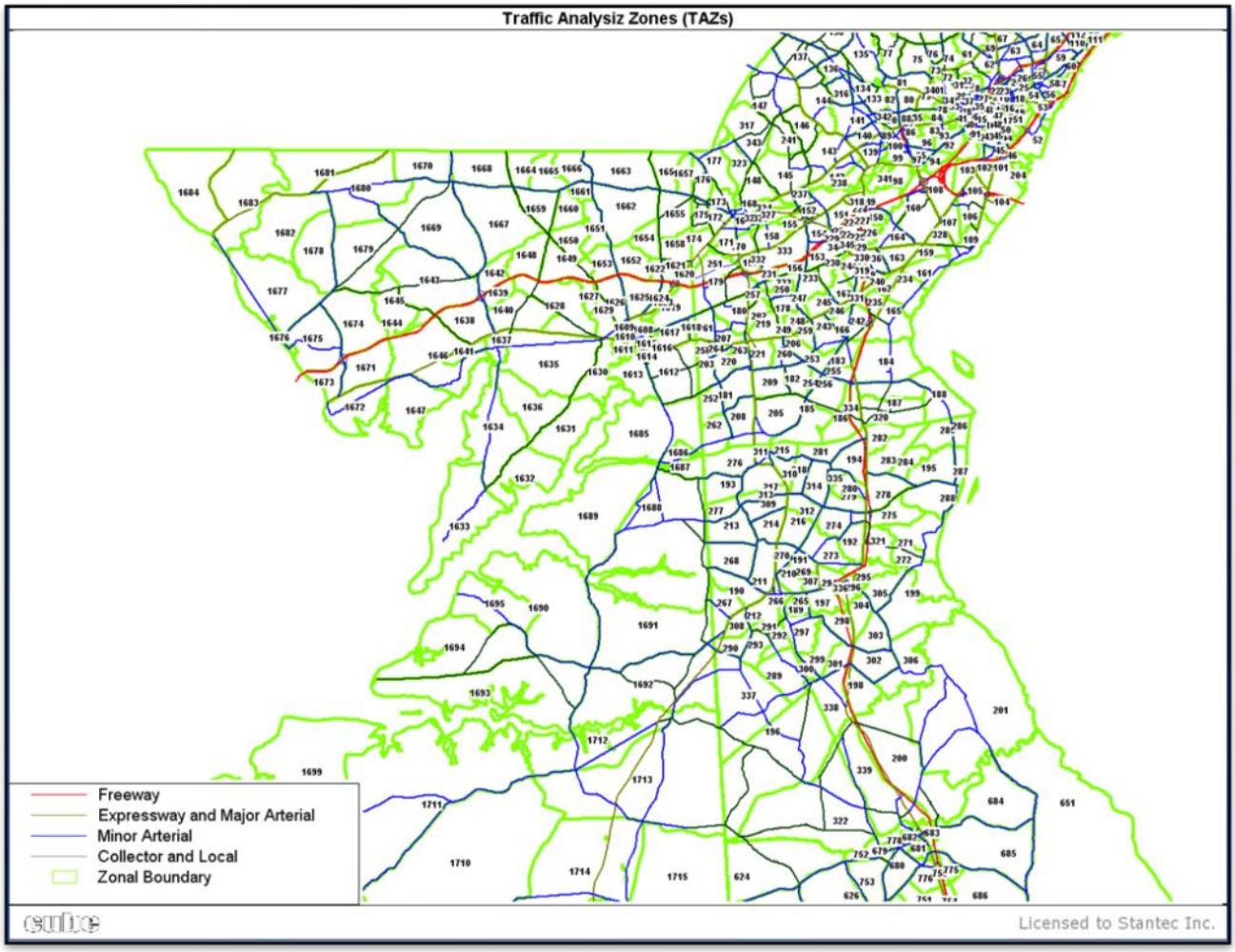


Figure 4-2
Regional Model Traffic Analysis Zones in US 301 Corridor



Utilizing the BMC regional networks Stantec expanded the highway network to include the network segments that influence routing decisions and potential diversion for choice trips west of the Chesapeake Bay. The primary network roadways were abstracted providing links from the decision point of the of I-95/1-495 & US 50 interchange east of Washington D.C. both northward to I-95 at the Susquehanna River and eastward to the Chesapeake Bay Bridge. These additional links included both the travel times and toll costs encountered traveling either of these routes.

Future year networks were also prepared for each of the horizon years for the modeled period up to the year 2040. The status of major improvement projects was reviewed and the projects were coded into the network using the latest available information for implementation. The specific projects and implementation assumptions are discussed in detail in Chapter 7.

4.1.3 Trip Table Development

As described earlier in Section 4.1, existing and future year daily trip tables were developed using the DelDOT Regional Model. Stantec utilized the trip generation, trip distribution, and mode choice model components of the regional model for this process. Trips were generated by incorporating the updated socioeconomic forecasts developed by ATG. Trip distribution and mode choice routines were then executed to develop daily vehicle trip tables. These routines utilized the highway skims that were generated using the enhanced highway networks described in Section 4.1.2. The regional model was executed using the standard procedures which includes a feedback process to ensure consistency of travel conditions in terms of times and costs across all model components.

In addition to the internal trips generated directly by the regional model, trips traversing into the adjacent regions outside the modeled area, referred to as “external trips”, are also used as inputs to the regional model. These trips include estimates of external-external (E-E) or through trips as well as external-internal (E-I) trips. The regional model was calibrated with external trips observed for 2008 and the model provided only forecasts for 2010 and 2030, with automated procedures to estimate horizons beyond 2030**.** At the Bay Bridge, which is the source of all external traffic using US 301 at the state line, the existing growth rate assumed in the DelDOT Regional Model was approximately 2.5 percent annually. This rate appears to be an aggressive assumption of growth in the corridor and was deemed unreasonably high for the purposes of this study.

In order to provide a more comprehensive and reasonable basis for estimating future year growth for the externally-oriented trips that could us the US 301 Mainline Toll Road, Stantec obtained observed traffic statistics from the primary roadways that support longer-distance, interstate movements within the US 301 Corridor. Two toll plaza locations on I-95 that parallel the US 301 alignment, the Newark Plaza on the Delaware Turnpike and the Mainline toll plaza on the JFK Expressway in Maryland, along with two other locations at either end of the project corridor (Delaware Memorial Bridge (I-295) and US 301 at the Chesapeake Bay Bridge) were summarized for this analysis. Note that all of these locations are at toll collection points for different toll authorities and have extensive and consistent historical traffic statistics from which long-term trends can be derived. The historical traffic data for these locations is provided in Table 4.2 from the year 2000 forward.

Table 4-2
Regional Highways - Observed Traffic Trends

Fiscal Year	I-95 at Newark Plaza		I-95 at JFK Plaza		US 301 at Bay Bridge		I-295 at Delaware Memorial Br.	
	Annual Transactions	AADT	Annual Transactions	AADT	Annual Transactions	AADT	Annual Transactions	AADT
2000	26,138,474	71,612	14,312,070	39,211	11,837,528	32,432	16,192,584	44,363
2001	26,724,378	73,217	14,532,715	39,816	11,961,513	32,771	16,416,847	44,978
2002	27,633,113	75,707	NA	NA	NA	NA	17,144,627	46,972
2003	27,727,195	75,965	14,533,718	39,818	12,280,793	33,646	17,215,450	47,166
2004	28,552,993	78,227	15,161,460	41,538	12,916,961	35,389	17,721,038	48,551
2005	28,410,738	77,838	14,945,482	40,947	12,957,861	35,501	17,593,410	48,201
2006	27,526,665	75,416	14,735,847	40,372	13,270,595	36,358	17,707,494	48,514
2007	27,110,032	74,274	14,840,303	40,658	13,494,252	36,971	17,643,881	48,339
2008	26,409,640	72,355	14,494,198	39,710	13,330,997	36,523	16,920,613	46,358
2009	25,811,851	70,717	14,641,784	40,114	12,751,820	34,936	17,126,876	46,923
2010	25,542,005	69,978	14,850,698	40,687	13,068,484	35,804	16,983,699	46,531
2011	24,459,985	67,014	15,088,005	41,337	13,340,750	36,550	16,937,320	46,404
Compounded Annual Growth Rate								
2000-2010	-0.2%		0.4%		1.0%		0.5%	
2000-2011	-0.6%		0.5%		1.1%		0.4%	
2000-2007	0.5%		0.5%		1.9%		1.2%	
2007-2011	-2.5%		0.4%		-0.3%		-1.0%	
2008-2011	-2.5%		1.3%		0.0%		0.0%	
Notes:								
I-295 FY 2011 Annual Transactions Estimated based on statistics for 7 months (January - July 2011)								

As shown in the table there has been significant variation for specific periods reflecting the changing economic conditions. For the I-95 Newark Plaza, I-295 at the Delaware Memorial Bridge and US 301 at the Bay Bridge, traffic has declined for the recent period from 2007 to 2011 as a result of the economic contraction following the 2008-2009 recession. During this period growth at the I-95 JFK Plaza has been minimal. For the 2000 to 2007 period which includes both a recession in 2001 and the resumption of strong growth up to the end of 2007, annualized growth rates at both of the I-95 plazas has been approximately 0.5 percent per year. During this same period growth at the Bay Bridge and the Delaware Memorial Bridge was 1.9 percent and 1.2 percent respectively. Over the longer period of 2000 to 2010 the growth rate at both of the I-95 plazas is less than 0.5 percent while the Bay Bridge has a growth rate of approximately 1.0 percent per year and growth on I-295 has been approximately 0.5 percent per year. Note that toll rates on I-95 were increased twice both in Maryland and Delaware during this decade, therefore it is possible that a portion of the growth on the Bay Bridge likely reflects some diversion to the largely non-tolled US 301 corridor. Construction of the Delaware Turnpike's I-95 Newark Plaza express toll lanes may have also diverted some traffic in 2010 and 2011.

For estimating the future long-distance traffic subject to toll diversion on the US 301 Mainline Toll Road, it was necessary to develop external trip estimates for 2015, 2021 and 5-year intervals thereafter out to 2041 for the key external zones representing the

Bay Bridge. Given the low levels of annual growth over the last 10 years, a decision was made to reduce the growth in external traffic using the Bay Bridge which is the primary source of external traffic for this project. It was assumed rate of growth in the external trips at the Bay Bridge would be 0.5 percent per year for the period between 2009 and 2015 and would then escalate upwards to 1.5 percent per year out to 2041. This provides a compounded rate of approximately 1.3 percent over the entire modeled forecast period. The reduced growth rate for the period between 2009 and 2015 reflects an assumed slow recovery from the 2008-2009 Recession. At other external zones, the estimated growth in traffic for the horizon years was also reduced in a similar manner.

As a final step in the trip table development process, the daily trip tables created by the DelDOT regional model were disaggregated into four distinct time periods. This step was necessary to create period-specific trip tables needed to perform traffic assignments using the toll diversion model. Trip tables were developed for the following four time periods:

- AM Peak (6:30 a.m. to 9:30 a.m.)
- Mid-Day (9:30 a.m. to 3:00 p.m.)
- PM Peak (3:00 p.m. to 6:00 p.m.)
- Night (6:00 p.m. to 6:30 a.m.)

Table 4-3 lists Time-of-Day (TOD) factors by trip purpose used by the regional model to allocate trips into the above four time periods. In order to retain the trips by purpose for the toll diversion model, the regional model trip tables in a production-attraction format immediately following mode choice were utilized. The time of day factors were then applied to these tables to convert the trips into the standard origin-destination (O-D) format required for use in highway assignment. The home-based trip purposes were converted into the O-D format by first transposing these trip tables (matrices) and then applying the appropriate “directional” TOD factors to each direction of travel. The non-home-based trips and external trips were provided in origin-destination format as part of the standard model execution.

The future year trip tables were developed for 2015, 2021 and subsequent five-year intervals to 2041. These trip tables were generated by executing the regional model for each horizon year with the revised socioeconomic data described in Chapter 5 and the future year highway networks discussed in Chapter 7. The 2015 horizon year represents the conditions assumed for the opening of mainline of the US 301 Mainline Toll Road. A future year trip table for 2019 was also prepared via straight-line interpolation using the 2015 and 2021 trip tables from the regional model to provide another near term horizon year estimate of demand.

Table 4-3
Time-of-Day Factors by Trip Purpose

PA Trip Factors

Time Period	Time Hours	HBW	HBSH	HBRSH	HBO	HBR	JTW	NHBNW	Others
AM	6:30-9:30 (3)	0.3822	0.0546	0.0434	0.2109	0.0944	0.1754	0.0762	0.1600
MID	9:30-13:00 (5.5)	0.0432	0.2189	0.3336	0.2112	0.2239	0.2658	0.5073	0.3000
PM	15:00-18:00 (3)	0.0215	0.0549	0.0350	0.0509	0.0546	0.3313	0.1485	0.2300
OFF-PEAK	18:00-6:30 (12.5)	0.0813	0.1057	0.0751	0.0661	0.1372	0.2275	0.2680	0.3100
Total 24 Hr		0.5282	0.4341	0.4871	0.5391	0.5101	1.0000	1.0000	1.0000

AP Trip Factors

Time Period	Time Hours	HBW	HBSH	HBRSH	HBO	HBR	JTW	NHBNW	Others
AM	6:30-9:30 (3)	0.0128	0.0265	0.0149	0.0361	0.0255			
MID	9:30-13:00 (5.5)	0.0433	0.2369	0.1576	0.2018	0.1034			
PM	15:00-18:00 (3)	0.2401	0.0986	0.1595	0.1113	0.0913			
OFF-PEAK	18:00-6:30 (12.5)	0.1756	0.2039	0.1809	0.1117	0.2697			
Total 24 Hr		0.4718	0.5659	0.5129	0.4609	0.4899	0.0000	0.0000	0.0000

Note:

HBW	Home-Based Work
HBSH	Home-Based Shopping
HBRSH	Home-Based Regional Shopping
HBO	Home-Based Other
HBR	Home-Based Recreation
JTW	Journey to Work (Non Home-Based Work)
NHBNW	Non Home-Based Non-Work
Others	Other Auto, Auto EE, and Trucks

4.2 Model Calibration

Utilizing existing count data and travel pattern data collected from the field survey, Stantec performed a final model calibration for the toll diversion process. The objective of the calibration was to replicate traffic flows specifically within the US 301 Corridor. This model calibration also included specific analysis related to trips by vehicle type (auto, truck) as well as specific travel patterns that would utilize the US 301 Mainline Toll Road. As part of the calibration Stantec compared the estimated travel speeds generated by the travel demand model against the 2010 travel time and speed data. As part of the calibration analysis, Stantec also analyzed initial estimates of toll constraint and elasticity using the latest available data from DelDOT's toll facilities. The model calibration year was 2009 and the trip tables were based on the adjusted 2009 baseline socioeconomic data estimates generated for this project as discussed in Chapter 5.The calibration approach was structured to simultaneously adjust the assignment procedure in order to replicate overall vehicle miles of travel (VMT) by facility type and area type on a regional basis as well as total traffic flows across primary screenlines. The calibration approach also refined the toll diversion model process to replicate tolled traffic at the Delaware Turnpike (I-95) Newark Plaza and the paypoints on the SR 1 Toll Road.

4.2.1 Calibration of Network Speeds

As part of the calibration process Stantec reviewed the model estimated speeds to ensure that values predicted by the model along the roadways in the vicinity of the US 301 Corridor are reasonable. This analysis was performed to ensure that the toll traffic predicted by the model is based on acceptable estimates of speeds and travel times in the corridor. This was an essential part of the model calibration since the level of congestion and potential travel time savings in the corridor are the primary factors influencing diversion of traffic to the tolled facilities.

Table 4-4 lists observed and model-estimated congested speeds during the AM and PM peak periods as well as during the mid-day off-peak period along the corridors in the US 301 project area. Note that the first two corridors in the table include the long distance routes from Washington D.C. to the I-95/SR 1 interchange while the last 5 corridors include the local routes near Middletown as shown previously in Figure 3-1. Overall the level of calibration of travel speeds was deemed reasonable for a planning model which does not have the capability of modeling queue spillbacks and delay associated with weaving movements.

The initial calibration of the highway assignment process and toll diversion model was conducted by performing network adjustments as necessary to minimize the difference between the estimated and observed link volumes as well as vehicle-miles-of-travel (VMT) as much as possible, while keeping the trip table constant. Overall model calibration of daily traffic was reasonable at this stage with respect to aggregate VMT. In order to further minimize the variation in overall VMT and to calibrate the share of traffic by vehicle type (auto and truck) Stantec staff employed a special trip adjustment process to minimize the differences in the observed counts and estimated link volumes. This process is an iterative routine which adjusts trip values between specific origin-destination zonal pairs based on the difference between observed counts and estimated link volumes along the path between the two zones.

Table 4-5 lists the comparison of the VMT estimated by the toll diversion model assignment process by facility type and area type combination. The highway assignment process provided a reasonable replication of the aggregate observed VMT by facility type and area type. As shown in Table 4-5, VMT was overall within 1 percent of the observed value and the replication by individual facility type and area type was also within acceptable tolerances, with the variation for freeways, expressways and major arterials all within 8 percent. FHWA standards recommend that the difference between target and estimated daily volumes to be within 7% for freeways, 10% for major arterials, and 15% for minor arterials.

Table 4-4
Travel Time Comparison Summary

Corridor		AM Peak (6:30am - 9:30am)						
		Observed			Estimated			Speed Diff (mph)
		Distance (mile)	Travel Time (min)	Speed (mph)	Distance (mile)	Travel Time (min)	Speed (mph)	
1. US 301 from I-95/US 50 Interchange to I-95/SR 1 Interchange via Bay Bridge [2]	NB	104.00	119.00	52.4	105.42	119.21	53.1	0.6
	SB	104.00	114.00	54.7	105.95	114.10	55.7	1.0
2. I-95 from I-95/US 50 Interchange to I-95/SR 1 Intechange via I-95	NB	98.00	93.00	63.2	98.35	94.67	62.3	-0.9
	SB	98.00	119.00	49.4	98.33	94.44	62.5	13.1
3. US 301 Local from MD/DE Stateline to Chesapeake City Rd.[1]	NB	11.00	15.00	44.0	10.90	15.13	43.2	-0.8
	SB	11.00	14.00	47.1	10.90	14.04	46.6	-0.6
4. Route 896 from US 301 to SR 1	EB	6.00	9.00	40.0	3.71	5.62	39.6	-0.4
	WB	6.00	8.00	45.0	3.71	5.38	41.3	-3.7
5. Route 299 from US 301 to SR 1	EB	3.00	6.00	30.0	2.84	7.21	23.6	-6.4
	WB	3.00	8.00	22.5	2.84	6.44	26.4	3.9
6. Choptank Road from US 301/RT 299 to US 301	NB	9.00	15.00	36.0	6.74	11.09	36.5	0.5
	SB	9.00	13.00	41.5	6.74	10.64	38.0	-3.5
7. MD 213 from US 301 to US-40	NB	22.00	30.00	44.0	26.76	34.58	46.4	2.4
	SB	22.00	30.00	44.0	26.76	31.79	50.5	6.5

Corridor		PM Peak (3:00 pm- 6:00 pm)						
		Observed			Estimated			Speed Diff (mph)
		Distance (mile)	Travel Time (min)	Speed (mph)	Distance (mile)	Travel Time (min)	Speed (mph)	
1. US 301 from I-95/US 50 Interchange to I-95/SR 1 Interchange via Bay Bridge [2]	NB	104.00	115.00	54.3	105.42	113.64	55.7	1.4
	SB	104.00	127.00	49.1	105.95	116.13	54.7	5.6
2. I-95 from I-95/US 50 Interchange to I-95/SR 1 Intechange via I-95	NB	98.00	107.00	55.0	98.35	94.62	62.4	7.4
	SB	98.00	108.00	54.4	98.33	95.08	62.0	7.6
3. US 301 Local from MD/DE Stateline to Chesapeake City Rd.[1]	NB	11.00	15.00	44.0	10.90	13.91	47.0	3.0
	SB	11.00	14.00	47.1	10.90	14.60	44.8	-2.4
4. Route 896 from US 301 to SR 1	EB	6.00	10.00	36.0	3.71	5.32	41.8	5.8
	WB	6.00	8.00	45.0	3.71	5.46	40.8	-4.2
5. Route 299 from US 301 to SR 1	EB	3.00	7.00	25.7	2.84	6.43	26.5	0.8
	WB	3.00	7.00	25.7	2.84	7.42	23.0	-2.7
6. Choptank Road from US 301/RT 299 to US 301	NB	9.00	17.00	31.8	6.74	10.64	38.0	6.2
	SB	9.00	13.00	41.5	6.74	10.79	37.5	-4.1
7. MD 213 from US 301 to US-40	NB	22.00	30.00	44.0	26.76	32.62	49.2	5.2
	SB	22.00	31.00	42.6	26.76	34.70	46.3	3.7

Corridor		MD/off peak (9:30 am - 3:00 pm)						
		Observed			Estimated			Speed Diff (mph)
		Distance (mile)	Travel Time (min)	Speed (mph)	Distance (mile)	Travel Time (min)	Speed (mph)	
1. US 301 from I-95/US 50 Interchange to I-95/SR 1 Interchange via Bay Bridge [2]	NB	104.00	109.00	57.2	105.42	113.53	55.7	-1.5
	SB	104.00	116.00	53.8	105.95	114.25	55.6	1.8
2. I-95 from I-95/US 50 Interchange to I-95/SR 1 Intechange via I-95	NB	98.00	93.00	63.2	98.35	94.37	62.5	-0.7
	SB	98.00	93.00	63.2	98.33	94.46	62.5	-0.8
3. US 301 Local from MD/DE Stateline to Chesapeake City Rd.[1]	NB	11.00	15.00	44.0	10.90	13.99	46.7	2.7
	SB	11.00	14.00	47.1	10.90	14.14	46.2	-0.9
4. Route 896 from US 301 to SR 1	EB	6.00	9.00	40.0	3.71	5.31	41.9	1.9
	WB	6.00	8.00	45.0	3.71	5.32	41.8	-3.2
5. Route 299 from US 301 to SR 1	EB	3.00	6.00	30.0	2.84	6.20	27.5	-2.5
	WB	3.00	8.00	22.5	2.84	6.25	27.2	4.7
6. Choptank Road from US 301/RT 299 to US 301	NB	9.00	15.00	36.0	6.74	10.64	38.0	2.0
	SB	9.00	13.00	41.5	6.74	10.64	38.0	-3.5
7. MD 213 from US 301 to US-40	NB	22.00	30.00	44.0	26.76	31.68	50.7	6.7
	SB	22.00	30.00	44.0	26.76	31.86	50.4	6.4

Table 4-5
Estimated / Observed VMT Ratios

Facility Type	Urban			Rural			Total		
	OBS	EST	EST/OBS	OBS	EST	EST/OBS	OBS	EST	EST/OBS
Freeway	1,611,987	1,488,741	0.92	714,927	698,372	0.98	2,326,914	2,187,113	0.94
Expressway	153,136	138,593	0.91	1,433,765	1,534,261	1.07	1,586,901	1,672,854	1.05
Major Arterial High	419,639	444,152	1.06	234,869	235,657	1.00	654,508	679,809	1.04
Minor Arterial	213,435	207,983	0.97	1,076,302	961,476	0.89	1,289,737	1,169,459	0.91
Local Collector	112,536	51,366	0.46	109,433	75,633	0.69	221,969	126,999	0.57
Ramp	19,255	10,494	0.55	1,706	613	0.36	20,961	11,107	0.53
Total	**2,184,762**	**2,071,486**	**0.95**	**2,383,561**	**2,468,290**	**1.04**	**4,568,323**	**4,539,776**	**0.99**

Screenlines were established at four key intercept lines as shown in Figure 4-3. In addition traffic at the major toll plazas for the Delaware Turnpike and SR 1 and the entry points to the regional model were also summarized as part of the comparison. The screenlines encompassed the major facilities traversing the C&D Canal (MD 213, SR 896-Summit Bridge, SR 1, and US 13), several of which support traffic destined to the US 301 corridor.

Table 4-6 lists calibration of daily traffic volumes by roadway across the screenlines. The screenline calibration ratios for all screenlines are within the range of (+/-) 5 percent except for Screenline 4 which is well south of the proposed toll road. The overall comparisons at the screenlines are adequate and have only minimal differences at the major tolling points listed in the last section of the table.

Screenline 1 intercepts all traffic entering Delaware north of the Chesapeake Bay including I-95. Estimated traffic for this screenline is generally close to the observed counts except that auto traffic on US 40 is over-estimated. Screenline 2 intercepts local and long-distance trips that use US 301 in Maryland and pass through the Middletown area via one of the C&D Canal crossings. Total traffic across each bridge is close to the observed total although the number of trucks is high for the SR 1 Bridge. Screenline 3 intercepts trips north of the Study area and the model replicates traffic on screenline within acceptable tolerances. Screenline 4, although well south of the state line, intercepts all of the approach roadways south of Middletown and the estimated traffic by roadway replicates the counts although traffic for US 301 is over-estimated at this location.

The model also adequately replicates the auto and truck traffic at the I-95 Newark plaza and the Chesapeake Bay Bridge that effectively intercept the majority of vehicles traveling along the competing I-95 and US 301 corridors.

Figure 4-3
Screenline Locations

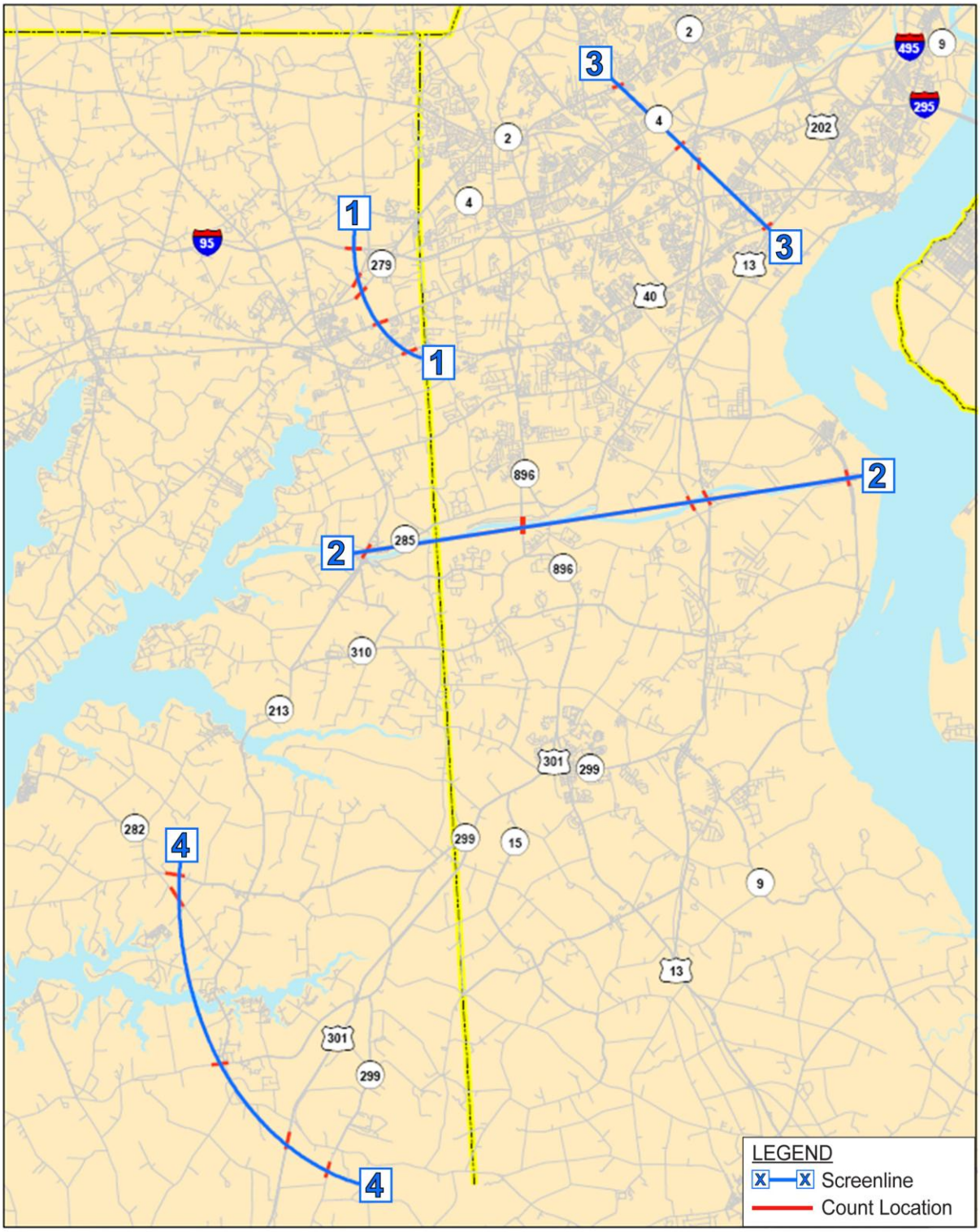


Table 4-6
Screenline Calibration

ROUTE	LOCATION	AUTO			TRUCK			TOTAL			TRUCK%		
		OBS	EST	RATIO	OBS	EST	RATIO	OBS	EST	RATIO	OBS	EST	DIFF
I-95 (John F Kennedy Memorial Hwy)	0.5 mi N of MD 272 (N East Rd)	77,480	70,321	0.91	13,860	10,849	0.78	91,340	81,170	0.89	15.2%	13.4%	-1.8%
MD 316 (Appleton Rd)	0.2 mi N of MD 279 (Elkton Rd)	4,400	4,646	1.06	230	888	3.86	4,630	5,534	1.20	5.0%	16.0%	11.1%
MD 279 (Elkton Rd)	0.2 mi N of MD 316 (Appleton Rd)	11,390	11,402	1.00	1,020	1,187	1.16	12,410	12,589	1.01	8.2%	9.4%	1.2%
MD 281 (Red Hill Rd)	between Muddy La & MD 781 (Delancy Rd)	6,600	6,224	0.94	80	67	0.84	6,680	6,291	0.94	1.2%	1.1%	-0.1%
US 40 (Pulaski Hwy)	0.5 mile W of MD 781 (Delancy Rd)	28,410	32,341	1.14	2,320	2,681	1.16	30,730	35,022	1.14	7.5%	7.7%	0.1%
		128,280	**124,934**	**0.97**	**17,510**	**15,672**	**0.90**	**145,790**	**140,606**	**0.96**	**12.0%**	**11.1%**	**-0.9%**
MD 213 (Augustine Herman)	N of C/D Canal Bridge - N of MD 285	12,710	14,264	1.12	1,840	2,180	1.18	14,550	16,444	1.13	12.6%	13.3%	0.6%
US 301/SR 896	At Summit Bridge	18,050	18,043	1.00	2,100	1,905	0.91	20,150	19,948	0.99	10.4%	9.5%	-0.9%
SR 1 (Korean War Vet Hwy)	C&D Canal Bridge	68,100	66,507	0.98	6,220	6,908	1.11	74,320	73,415	0.99	8.4%	9.4%	1.0%
SR 13 (Dupont Pkwy)	St Georges Bridge	10,870	11,413	1.05	860	984	1.14	11,730	12,397	1.06	7.3%	7.9%	0.6%
SR 9 (Port Penn Rd)	Reedy Point Bridge	2,170	2,084	0.96	160	98	0.61	2,330	2,182	0.94	6.9%	4.5%	-2.4%
		111,900	**112,311**	**1.00**	**11,180**	**12,075**	**1.08**	**123,080**	**124,386**	**1.01**	**9.1%**	**9.7%**	**0.6%**
RT 2 (Kirkwood Hwy)	between Harmony Rd & Henderson Rd	28,540	28,798	1.01	570	742	1.30	29,110	29,540	1.01	2.0%	2.5%	0.6%
RT 4 (Ogletown Stanton Rd)	b/w Salemchurch Rd & Churchman's Rd	28,080	28,283	1.01	4,200	4,233	1.01	32,280	32,516	1.01	13.0%	13.0%	0.0%
I-95 (Delaware Tpke)	West of SR 1	138,110	134,303	0.97	26,310	24,573	0.93	164,420	158,876	0.97	16.0%	15.5%	-0.5%
SR 1 (Korean War Vet Hwy)	S of I-95	55,660	55,229	0.99	6,460	6,763	1.05	62,120	61,992	1.00	10.4%	10.9%	0.5%
US 40 (S. Dupont Pkwy)	E of US 13	69,440	69,677	1.00	6,860	7,424	1.08	76,300	77,101	1.01	9.0%	9.6%	0.6%
		319,830	**316,290**	**0.99**	**44,400**	**43,735**	**0.99**	**364,230**	**360,025**	**0.99**	**12.2%**	**12.1%**	**0.0%**
MD 282 (Crystal Beach RD)	West of Cecilton	3,680	3,697	1.00	480	441	0.92	4,160	4,138	0.99	11.5%	10.7%	-0.9%
Sandy Bottom Rd	West of MD 213	1,060	1,085	1.02	140	108	0.77	1,200	1,193	0.99	11.7%	9.1%	-2.6%
MD 213 (Augustine Herman)	West of MD 290	3,290	3,767	1.14	960	942	0.98	4,250	4,709	1.11	22.6%	20.0%	-2.6%
US 301 (Blue Star Memorial)	South of MD 313	6,900	8,812	1.28	3,640	3,797	1.04	10,540	12,609	1.20	34.5%	30.1%	-4.4%
MD 313 (Galena Rd)	South of MD 330	1,590	1,602	1.01	380	364	0.96	1,970	1,966	1.00	19.3%	18.5%	-0.8%
		16,520	**18,963**	**1.15**	**5,600**	**5,652**	**1.01**	**22,120**	**24,615**	**1.11**	**25.3%**	**23.0%**	**-2.4%**
I-95 (John F Kennedy Memorial Hwy)	Tydings Memorial Bridge	69,602	64,209	0.92	12,450	11,399	0.92	82,052	75,608	0.92	15.2%	15.1%	-0.1%
I-95 (Delaware Tpke)	PA State Line	101,730	99,663	0.98	12,580	12,192	0.97	114,310	111,855	0.98	11.0%	10.9%	-0.1%
I-295	Delaware Memorial Bridge	78,760	77,363	0.98	15,010	14,924	0.99	93,770	92,287	0.98	16.0%	16.2%	0.2%
US 301/US 50 (Blue Star Memorial Hwy)	Bay Bridge	64,894	65,911	1.02	6,870	6,887	1.00	71,764	72,798	1.01	9.6%	9.5%	-0.1%
		314,986	**307,146**	**0.98**	**46,910**	**45,402**	**0.97**	**361,896**	**352,548**	**0.97**	**13.0%**	**12.9%**	**-0.1%**
I-95 (Delaware Tpke)	Newark Toll Plaza	59,983	58,250	0.97	11,430	11,994	1.05	71,413	70,244	0.98	16.0%	17.1%	1.1%
SR 1 (Korean War Vet Hwy)	Biddles Toll Plaza	41,049	43,772	1.07	4,760	4,379	0.92	45,809	48,151	1.05	10.4%	9.1%	-1.3%
SR 1 (Korean War Vet Hwy)	Dover Toll Plaza	30,001	29,633	0.99	3,600	3,467	0.96	33,601	33,100	0.99	10.7%	10.5%	-0.2%
		131,033	**131,655**	**1.00**	**19,790**	**19,840**	**1.00**	**150,823**	**151,495**	**1.00**	**13.1%**	**13.1%**	**0.0%**
US 301	at MD/DE Stateline	8,400	8,736	1.04	2,400	2,439	1.02	10,800	11,175	1.03	22.2%	21.8%	-0.4%

It should also be noted that the latest counts from the toll facilities do include the impacts of the recession and therefore the observed number of trucks is generally a lower percentage of the total vehicles than values observed prior to the recession. It is assumed that the truck percentages will increase as the economic conditions improve going forward.

4.2.2 Corridor Specific Calibration

As part of the model calibration effort, Stantec performed a corridor-specific calibration that was calibrated to the 2009 observed count data obtained for this project. The corridor specific calibration was focused primarily on the replication of traffic in the northern section of the model that encompassed the corridors served by the I-95 and US 301. The model calibration was structured to replicate both auto and truck volumes within these corridors where sufficient count data were available. Stantec also adjusted the toll diversion model in order to replicate the observed traffic on the SR 1 and I-95 toll facilities, with particular emphasis on tolled traffic at the I-95 plaza.

4.3 Toll Diversion Methodology

The proportion of traffic predicted to use the tolled lanes is estimated by a customized toll diversion model implemented within the highway assignment process. Within the framework of the assignment process, the toll diversion routine estimates future year toll traffic and revenue for this project. The toll diversion model is essentially a "route choice" model built into the traffic assignment routine that permits the model to allocate trips between the best toll route and the best non-toll route for a given origin-destination zonal pair. The toll diversion model was structured as binary logit model that estimated the probability of selecting a toll road based on tradeoff between travel time savings and associated toll costs. The toll diversion model has the following structure:

$$Toll\ Share = \frac{1}{(1 + e^{U})}$$

Where:

Toll Share	=	Probability of selecting a toll road
e	=	Base of natural logarithm (ln)
U	=	a x ($Time_{TR}$ – $Time_{FR}$) + b x (Cost) + C_{TR}
$Time_{TR}$	=	Toll road travel time in minutes
$Time_{FR}$	=	Non-Toll road travel time in minutes
Cost	=	Toll cost in dollars
ln	=	The natural logarithm function
C_{TR}	=	Toll road bias constant
a, b	=	Time and cost coefficients

In the above logit equation, the relationship between the coefficients *a* and *b* creates an implied value of time. The toll bias constant C_{TR} is a penalty that discourages the use of toll roads, reflecting a preconceived reluctance on the part of travelers to utilize toll roads. It represents a bias against the use of toll roads, after evaluation of the time and

cost trade-offs. The value of this constant is a reflection of travelers' initial opposition to the introduction of toll roads in the region. In regions where toll facilities are present, the toll bias terms tend to be minimal, as travelers recognize the benefits, in terms of timesaving provided by the toll facilities. Since toll facilities are prevalent throughout Delaware and the eastern portion of Maryland, it was assumed that auto travelers would not have an initial bias against the new toll road. In contrast, the bias term was retained for truck trips in order to provide more conservative forecasts with respect to revenue from truck traffic.

The toll diversion model was also structured to enable market segmentation by payment type (i.e., ETC, cash or video-tolling) thereby producing separate traffic forecasts for each market segment. As part of the model development effort, Stantec calibrated and validated the toll diversion model using the 2009 transaction statistics from the Delaware Turnpike and SR 1. It included an extensive validation effort to ensure that they provide appropriate level of sensitivity to key policies, such as variation in toll rates.

The values of the time and cost coefficients and the bias constants used in the toll diversion model are listed in Table 4-7. The time and cost coefficients, as well as the bias terms for the truck-based trip purposes were adopted from the existing toll diversion model used in earlier studies in the corridor and recalibrated for the 2009 conditions.

Table 4-7
Toll Diversion Model Parameters

Trip Purpose / Mode	Time Coefficient (a)	Cost Coefficient (b)	Value of Time ($/hour)
AUTO			
Home-Based Work	0.1842	0.57460	$19.23
Home-Based Shopping	0.0754	0.43100	$10.50
Home-Based Other	0.0662	0.26700	$14.88
Non-Home-Based Other	0.1159	0.61430	$11.32
Journey-to-Work	0.1655	0.61430	$16.16
TRUCK	0.2334	0.30760	$45.53

These coefficients and constant terms provided reasonable relationships and predicted logical toll diversion rates. An analysis of the value of time implied by the time and cost coefficients was also performed. The values of time vary by auto trip purpose within a range from $10.50 to $19.23 per hour. For auto trips, the higher values, such as those associated with home-based-work trips and journey-to-work trips, indicate a greater willingness to pay a toll in order to save travel time. This willingness is most likely due to the urgency associated with those trip purposes. In contrast, the lower values of time for

purposes such as home-based shopping and non-home-based other trips suggest that these trips are less willing to pay the toll associated with the time savings. For trucks, the relatively high value of time reflects the greater sensitivity related to the delivery of the commodities being transported and costs associated with truckers' salaries.

The value of time was also compared to the average wage rate of the region. For 2009, the median household income of New Castle County was $62,051 and the weighted average median household income of Maryland Counties in the US 301 Corridor was approximately $61,800. From the regional model trips and the values of times for each trip purpose listed in Table 4-6 the weighted average value of time is approximately $15.45, which is approximately 52.0% of the wage rates for the study area counties. This relationship is consistent with the expectation that the value of time should be within 50 to 70% of the median wage rate. It should be noted that the trips passing through US 301 also include a significant amount of from outside of the study area. This would include areas such as northern Virginia, Washington D.C., and Maryland west of Chesapeake Bay as well as eastern Pennsylvania, New Jersey and New York. The incomes of travelers from these areas are likely higher than the average incomes of the study area.

The toll bias term for the truck trip purpose was calibrated to ensure that they provided a reasonable relationship within the toll diversion model. The bias terms are can be expressed in terms of equivalent minutes of penalty applied to the toll choice path. These equivalent penalty minutes are calculated by dividing the bias constant by the time coefficient for the truck purpose. The equivalent penalty for the truck purpose calibrated in the model was approximately 8 minutes to replicate the tolled truck trip patterns on the Delaware Turnpike and SR 1 Biddles and Dover mainline toll plazas. Bias penalties for ETC usage were also added to replicate the shares of transactions by payment method.

5 SOCIOECONOMIC FORECASTS

Traffic forecasts for the US 301 project were developed using future travel demand from the Delaware Department of Transportation's (DelDOT) 2010 Regional Model. The DelDOT Regional Model was discussed in the previous chapter and modeled area was depicted previously in Figure 4.1. This regional model uses both socioeconomic data such as population and employment as generators of internal trips, as well as other estimates of future traffic growth at the model's external zones, as discussed previously in Section 4.1.3, to estimate the total travel demand within the region.

The following sections of this chapter present a discussion of historical and projected growth trends for population and employment, the methodology used to develop projections of these forecasts for use in the regional transportation model, the adjusted forecasts included in the model, and other relevant factors used in the model for projecting future traffic volumes. This information was developed from a study report prepared for this project by Alliance Transportation Group (Alliance), which is presented in the Appendix A of this report.

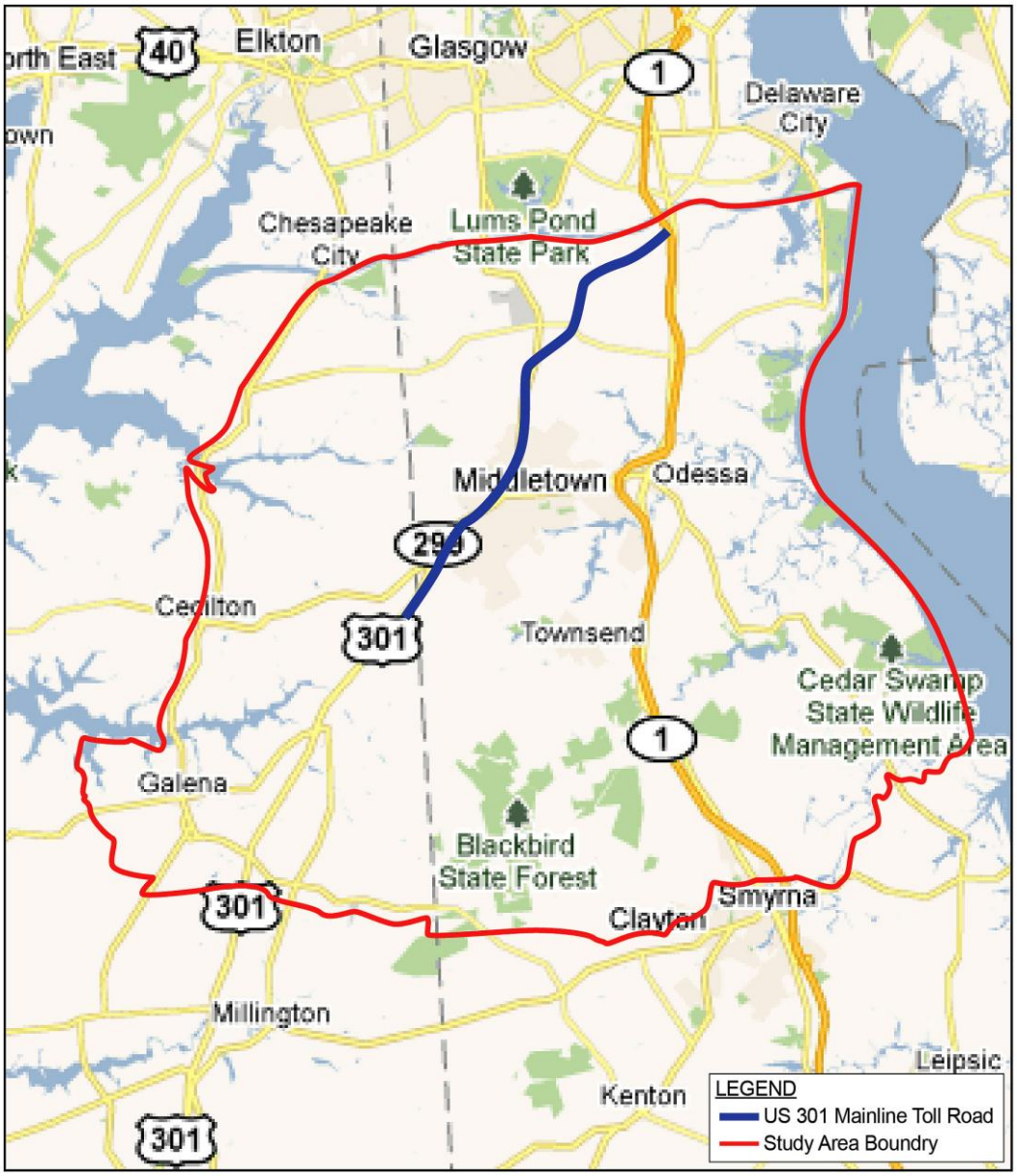
5.1 Socioeconomic Data Review Methodology

For this study, historical population and employment and population forecasts prepared by the U.S. Bureau of Census state agencies were reviewed; conversations were held with representatives of regional and local government agencies; windshield surveys were conducted; inventories were made of platted projects, maps and plans of the study area; and digital aerial photography and other relevant literature were reviewed. Based on this information, and using professional judgment, adjustments were made to the socioeconomic forecasts in the DelDOT 2010 Transportation Model.

The study area for this project is defined at two levels: the 12-county region included in the regional transportation model depicted in Figure 4-1, and sections of three counties in the vicinity of the project, depicted in Figure 5.1

The twelve counties included in the regional transportation model are: Kent, New Castle and Sussex counties in Delaware and Caroline, Dorchester, Kent, Queen Anne's, Somerset, Sussex, Talbot, Wicomico and Worchester counties in Maryland. The US 301 study area in the vicinity of the project consists of New Castle County south of the Chesapeake and Delaware Canal and portions of southwestern Cecil County and northwestern Kent County in Maryland.

Figure 5-1
Study Area in Vicinity of US 301 Mainline Toll Road



5.2 Historical and Projected Population Trends.

The 2010 population within the 12-county DelDOT Regional Model area, as shown previously in Table 4-1, was at 1.3 million according to the U.S. Bureau of Census. This was an increase of more than 167,000 residents since the 2000 U.S. Census as listed in Table 5-1. During this period, the overall growth rate of the 12-county region was 14.2 percent, or a compounded annual growth rate (CAGR) of 1.3 percent.

Table 5-1
Historical Population Delaware Regional Model Area

Area	Estimated Total Population		Change	CAGR
	2000 Census	2010 Census	2000 - 2010	2000 - 2010
Cecil County, MD	85,951	101,108	15,157	1.6%
Kent County, MD	19,200	20,197	997	0.5%
New Castle County, DE	500,272	538,479	38,207	0.7%
Study Area Counties	605,423	659,784	54,361	0.9%
Remaining 9 Counties	574,038	687,376	113,338	1.8%
Total	1,179,461	1,347,160	167,699	1.3%

Source: US Census Bureau

Of the three counties in the vicinity of the project, New Castle County, which contains the city of Wilmington, Delaware and much of the project study area, is the largest with a 2010 population of 538,479 residents. The two other counties in the project study area, Cecil County, Maryland and Kent County, Maryland, had 2010 populations of 101,108 and 20,197 residents, respectively. Growth in New Castle County between the 2000 and 2010 U.S. Census population was a modest 7.6 percent or a CAGR of 0.7 percent. Population growth in Cecil County was higher at 17.6 percent (1.6 percent CAGR); while population growth in Kent County, MD was lower at 5.2 percent (0.5 percent CAGR).

For this study, population forecasts produced by the official forecasting agencies for the two states, the Delaware Population Consortium and the Maryland State Data Center, were reviewed. The most recent projections are based on the 2000 Census and were prepared for five-year intervals between 2000 and 2040.

For the 12-county region, population is anticipated to increase from 1,347,160 in 2010 to 1,725,073 in 2040, an increase of 377,913 persons, or an average annual growth rate of 0.8 percent. Regarding the three counties in the vicinity of the project, these projections show relatively slow and diminishing growth rates for New Castle County through 2040. New Castle County's projected 2040 population is 606,881 residents or an increase of more than 68,400 residents over the 2010 U.S. Census estimate, or a CAGR of 0.4 percent during this period. In Maryland, Cecil County is expected to add 64,692 residents, a CAGR of 1.7 percent, between 2010 and 2040. Kent County's population growth, on the other hand, is expected to be significantly more constrained with approximately 4,000 new residents added during this period, or a CAGR of 0.6 percent.

Projected population for the twelve county area and the three counties in the vicinity of the project are shown in Table 5-2.

Table 5-2
Projected Population

Area	Total Population		Change	CAGR
	2010 Census	Estimated 2040	2010 - 2040	2010 - 2040
Cecil County, MD	101,108	165,800	64,692	1.7%
Kent County, MD	20,197	24,300	4,103	0.6%
New Castle County, DE	538,479	606,881	68,402	0.4%
Study Area Counties	659,784	796,981	137,197	0.6%
Remaining 9 Counties	687,376	928,092	240,716	1.0%
Total	1,347,160	1,725,073	377,913	0.8%

Sources: Delaware Population Consortium, 2010;
Maryland State Data Center, 2010.

5.3 Historical Employment Trends

Table 5-3 provides total employment estimates from the U.S. Bureau of Labor Statistics' Quarterly Census of Employment and Wages (QCEW) for counties in the DelDOT Regional Transportation Model for 2001, 2007 and 2010. The data show that the region had no net employment growth over this nine year period. Gains between 2001 and 2007 were lost between 2007 and 2010, typical of the response to the recession throughout the country. Total employment decreased for the 12-county region between 2001 and 2010 by 571 jobs.

In the three counties in the vicinity of the project, total employment decreased 18,343 between 2001 and 2010 primarily due to a loss of 20,337 jobs in New Castle County. In the Maryland counties, Cecil County showed a gain while Kent County was at the same level as 2001.

Table 5-3
Historical Employment Delaware Regional Model Area

	Estimated Total Employment		
	2001	2007	2010
Cecil County, MD	25,573	30,763	27,822
Kent County, MD	7,914	8,600	7,659
New Castle County, DE	282,318	283,231	261,981
Study Area Counties	315,805	322,594	297,462
Remaining 9 Counties	235,414	266,911	253,186
Total	551,219	589,505	550,648

	Change in Employment			
		2001 - 2007	2007 - 2010	2001 - 2010
Cecil County, MD		5,190	(2,941)	2,249
Kent County, MD		686	(941)	(255)
New Castle County, DE		913	(21,250)	(20,337)
Study Area Counties		6,789	(25,132)	(18,343)
Remaining 9 Counties		31,497	(13,725)	17,772
Total		38,286	(38,857)	(571)

	Compounded Annual Growth Rate			
		2001 - 2007	2007 - 2010	2001 - 2010
Cecil County, MD		3.1%	-3.3%	0.9%
Kent County, MD		1.4%	-3.8%	-0.4%
New Castle County, DE		0.1%	-2.6%	-0.8%
Study Area Counties		0.4%	-2.7%	-0.7%
Remaining 9 Counties		2.1%	-1.7%	0.8%
Total		1.1%	-2.2%	0.0%

Source: US Bureau of Labor Statistics.

5.4 US 301 Study Area Growth Patterns

The US 301 study area experienced significant residential and commercial development between 2000 and 2008 and, as residential growth has occurred, so has economic activity. Starting in 2008, there has been a substantial slowing of new residential and commercial construction, but it has not come to a complete halt. The sections below will address recent, ongoing, and anticipated residential and commercial development projects within the US 301 study area.

5.4.1 Recent Residential Development

As of late 2010, there were 16 active subdivisions approved and under construction within the US 301 study area in New Castle County. A total of 6,325 lots have been platted and 1,734 units completed. There are approximately 4,600 available lots. No recent residential construction was identified or observed within the US 301 study area in Cecil or Kent Counties, Maryland.

5.4.2 Future Residential Growth

The recession that began during 2008 substantially slowed the development of existing residential subdivisions within the US 301 project study area and delayed planned projects. Even as the national economy has started to improve and the regional economy is approaching stabilization, it is still not possible to predict precisely when the regional housing market will recover. The market will most likely be depressed for an additional one to three years. Household formation and construction volume will be much slower than in the mid-2000s. As the housing market contracts and eventually recovers, local planners anticipate that slightly more than half of the new population growth in New Castle County will occur within the US 301 study area. In addition to the remaining lots in existing subdivisions under construction (during December 2010), there are almost 12,000 lots or multifamily units in 29 subdivisions that have been either through the platting and subdivision approval process or have been placed on hold due to market conditions.

Most proposed subdivisions in New Castle County fall within the preferred development corridor between the current US 301 and Route 1. However, there are other approved subdivisions that are outside of this corridor and New Castle County government will allow certain ones to proceed. Any future subdivisions seeking approval will need to locate within the preferred growth corridor or would need to supply their own water and wastewater utilities in order to be considered for approval.

Relatively little new residential growth has occurred in the portion of the US 301 study area that lies within Cecil County or Kent County, Maryland and little new growth is

expected. Within Cecil County, large areas of land have been set aside, through the purchase of easements, for agricultural or ecological preservation. As a result, current land uses are very unlikely to change over the forecast horizon. In areas that do permit new residential development, future growth has been restricted to very low densities (e.g. one residential unit per 20 acres). In areas without these restrictions, four subdivisions are proposed in Transportation Analysis Zone (TAZ) 1691, ranging in size from 8 to 47 lots. County planners also identified an area of land south of Chesapeake City that might be developed in the future.

While future residential development in Kent County, Maryland is less hindered by easements, there are similar restrictions on housing densities (e.g. one residential unit per 30 acres). Within the town of Galena, a Kent County planner in 2008 identified the new phase of a subdivision with 100 lots. The county planner also identified several proposed rural subdivisions east of the nearby town of Fredericktown with 8 to 10 lots. These factors were considered when assessing and adjusting the population forecasts for the TAZs in the model.

5.4.3 Recent Commercial Development

Commercial development in the US 301 study area has slowed down between the October 2008 and December 2010 field surveys. While Middletown's rapidly growing population and its relative distance from Newark and Wilmington have encouraged new retailers, restaurants, medical services, and other professional service providers to expand into the market, regional job losses have tempered the growth. Many of the newly constructed commercial buildings in the project study area, which house multiple office or retail tenants, had one or more office suites or retail spaces empty during the field survey. These vacant suites or storefronts will certainly be occupied over time, but probably at a slower pace than initially anticipated by their developers. The narrative below describes recent and ongoing commercial development in the US 301 project study area during December 2010.

In New Castle County, west of US 301, there have been some recent developments, including a Wal-Mart super center and the Bunker Hill Elementary School.

East of US 301 and West of Route 1 in New Castle County there is a very active area for commercial development in Middletown. A Home Depot store, two fast food restaurants and a large convenience store were recently completed. Also, St. Andrew's School was building new facilities on its campus and Levels Road Park, a county facility, was opened.

No new commercial development was identified from the aerial photography or during the field survey in the study area East of Route 1 in New Castle County or in Cecil or Kent counties, Maryland.

5.4.4 Future Commercial Development

A number of commercial projects are anticipated in and around the Town of Middletown, although the exact timing for many of these projects is not certain. As the regional economy stabilizes and as the residential and commercial real estate markets continue to underperform, these conditions will likely delay many of the proposed projects. The projects discussed in the narrative below were identified during December 2010 meetings with planners at the Town of Middletown and New Castle, Cecil, and Kent Counties.

The largest commercial project anticipated in the US 301 study area is a 460-bed hospital, located on the east side of Middletown. It is anticipated that this facility will employ between 1,500 and 2,000 workers. A rehabilitation center is also being planned, which is expected to employ several hundred additional workers. In addition, office, retail, and other commercial projects have been proposed for available parcels both in Middletown and in other sections of New Castle County.

In Cecil County, there is the possibility of commercial development in the area south of Chesapeake City, but no specific plans were identified. There is no pending commercial development anticipated in the Kent County, MD portion of the study area.

5.5 Assessing and Adjusting the Population and Employment Forecast

5.5.1 Forecast at County Level

Total population and employment in the model were adjusted to develop control totals for each county in the 12-county study area. The socioeconomic data assessed for this study included Wilmington Area Planning Council's (WILMAPCO) 2011 forecasts for New Castle and Cecil counties and data from DelDOT's Regional Model for the remaining counties. The revised control totals for the counties reflect the trends noted above and anticipate reasonably modest growth through the forecast year of 2040, while also accounting for a stabilization of the local economy in the near term. The baseline 2009 population control totals for each county in the model were adjusted to the U.S. Census Bureau's population estimates for 2009, which took into account the results from the 2010 U.S. Census count. The 2010 population estimates were based upon the same U.S. Census data set.

Baseline employment estimates for the counties were adjusted to the Delaware Department of Labor's and the Maryland Department of Labor, Licensing, and

Regulation's QCEW data. Using these data led to a lower employment estimate than the 2010 DelDOT model's assumptions. While there are some shortcomings to the QCEW employment estimates, such as not counting agricultural workers and the self-employed, they also are more likely than other data sources to accurately reflect the number of individuals who commute to work.

The estimated population and employment for 2010 and 2040 for the total 12-county region and the three counties in the vicinity of the project are shown in the following tables. Data at five-year intervals for each of the twelve counties are shown in the full socioeconomic report in the appendix to this report.

Table 5-4
Population Projection for Use in Regional Model

Area	Used in Model		Change	CAGR
	2010	2040	2010 - 2040	2010 - 2040
Cecil County, MD	101,519	155,883	54,364	1.4%
Kent County, MD	20,226	23,580	3,354	0.5%
New Castle County, DE	536,583	598,896	62,313	0.4%
Study Area Counties	658,328	778,359	120,031	0.6%
Remaining 9 Counties	690,518	939,809	249,291	1.0%
Total	1,348,846	1,718,168	369,322	0.8%

Table 5-5
Employment Projection for Use in Regional Model

Area	Used in Model		Change	CAGR
	2010	2040	2010 - 2040	2010 - 2040
Cecil County, MD	27,988	46,071	18,083	1.7%
Kent County, MD	7,645	9,325	1,680	0.7%
New Castle County, DE	262,250	279,228	16,978	0.2%
Study Area Counties	297,883	334,624	36,741	0.4%
Remaining 9 Counties	253,342	320,496	67,154	0.8%
Total	551,225	655,120	103,895	0.6%

5.5.2 Population and Employment Assessment and Adjustment

To develop projections of population and employment on the TAZ level, the existing population and employment forecasts produced for each TAZ in the U.S. 301 project study area were assessed and various additional sources were investigated. These sources include: windshield surveys, interviews with local planning agencies, digital aerial photography, inventories of platted projects, maps, plans, and other relevant literature. Interviews were conducted with the staff of planning offices in New Castle County, Cecil County, Kent County (Maryland), the Town of Middletown, and Wilmington Area Planning Council (WILMAPCO). Based on this information, and the consultant's judgment and experience in the area, adjustments were made to the population and employment projections on the TAZ level.

5.5.3 Other Factors

Other adjustments to other socioeconomic factors in the model include:

- Employment by Sector - The assignment of employment by sector was not changed for the 2009 baseline figures or for any of the forecast periods, except for the TAZs within the US 301 project study area. Outside of that exception, in instances where a TAZ's total forecasted employment was adjusted, the employment by sector was adjusted proportionately to the changes made to the TAZ's total employment forecast.

- Median Household Income - It was judged that WILMAPCO's median household income estimates and the DelDOT 2010 Regional Model's median household income estimates did not adequately account for recent national trends, under which household incomes have declined. The median household income value for all TAZs was reduced by 2.0 percent between 2009 and 2010. The values were further reduced by 0.5 percent for each year between 2010 and 2015. All zonal median household income values were then maintained at the 2015 level for all future forecast periods.

- Households - An assessment used an estimate of persons per household for each forecast period, which was based upon the figures assumed by the DelDOT 2010 Peninsula model for all counties but New Castle and Cecil counties. In New Castle County, due to discrepancies within the agency's data, the 2010 persons per household value was used to produce all future estimates of households by zone. In Cecil County, the WILMAPCO estimates of person per household for each forecast period were judged to be reasonable.

- Adjustments to Forecasts Outside of the Study Area - Adjustments to the population and employment forecasts of TAZs outside of the project area were weighted according to the difference between forecast periods. Forecasts for individual TAZs outside of the study area were not reviewed for reasonableness nor were further adjustments made.

5.6 Conclusions

The 12 counties within the DelDOT Regional Model are currently experiencing modest population growth and stabilizing employment levels after the effects of the national recession. In terms of total population and employment, the 12 counties are dominated by New Castle County but from a broader perspective, the area's growth patterns have also been influenced by changes in the Philadelphia-Washington-Baltimore corridor. The intense downward pressure from the national economy has had an impact on population and employment growth patterns at the local level but these pressures are likely diminishing as the national economy improves.

During the past few years, the region (primarily New Castle County) has experienced significant job losses from individual employers, such as the closure of the Chrysler automobile manufacturing plant in Newark, Delaware and the culling of jobs in the financial sector. As the nation slowly emerges from the current downturn, its and the region's recovery will be modest and will likely require a number of years or even more before economic activity approaches earlier rates of growth, as that the United States has entered into a new period of slower economic growth.

Collectively, ongoing problems in the financial sector, government debt and problems with governance, along with fluctuations in fuel costs, will affect the spatial allocation of land development, since consumers have become reliant upon easy access to credit and fuel to create and sustain cheap housing and sprawling development patterns. However, population growth in the US 301 study area will continue, although at more modest rates. The overall level of employment within the US 301 study area has likely increased during the past few years with the opening of various retail stores and is expected to grow further with the construction of new medical facilities that will provide a significant increase to the study area's future employment. Both trends should support growing traffic volumes on the proposed US 301 Mainline.

6 TOLL COLLECTION PLAN

The proposed US 301 Mainline Toll Road is configured as a limited access roadway connecting the existing four-lane section of US 301 at the Maryland state line to SR 1 just south of the C&D Canal. The mainline toll road is 14 miles in length and has interchanges at Jamison Corner Road, Summit Bridge Road just north of Armstrong Corner Road and Levels Road. The toll road configuration was also designed to accommodate the future 3.5 mile Spur Road that provides access to SR 896 just south of the Summit Bridge. Toll charges are assessed at the mainline barrier just north of the Maryland state line and at the ramps serving traffic to/from the north at each of the interchanges.

It is assumed that the July 1, 2015 opening date refers to the commencement of tolled operation for the facility. It is anticipated that the facility will be opened to traffic for a few months prior to July as part of an introductory marketing period in order to introduce travelers to the new roadway and to permit additional testing of electronic toll collection systems. Note that any revenue obtained during the introductory period is not included in the project revenue stream provided in this report.

6.1 Toll Rates

The toll collection plan for the US 301 Mainline Toll Road utilizes a barrier/ramp system of pay points that ensures that all traffic using the facility will pay a toll. Table 6-1 lists the assumed toll rates for two-axle and five-axle vehicles for the 2015 opening year. The proposed toll collection plan also assumed a series of periodic toll increases starting in the year 2021.

In addition, the toll setup described above was developed to provide an incentive for truckers to remain on the mainline roadway, instead of diverting from the mainline roadway to avoid the Middletown plaza toll. The toll policy was established to be generally consistent with rates and payment terms provided on the Delaware Turnpike in each horizon year. The two-axle tolls are reduced from the $4.00 Middletown plaza toll to 50 cents at the Jamison Corner Road ramps, based on the approximate distance from the SR 1 junction. In contrast, the rates for multi-axle vehicles at all ramp plazas are reduced by $1.00 from the mainline tolls to discourage truck trips from bypassing the mainline plaza.

Table 6-1
US 301 Mainline Tolls Effective July 2015

Toll Location	Tolls *	
	2-axle	5-axle
Middletown plaza	$4.00	$11.00
Levels Road ramps	$1.00	$10.00
Summit Bridge Road ramps	$0.75	$10.00
Jamison Corner Road ramps	$0.50	$10.00

*Shown are the two-axle and five-axle tolls. Other multi-axle tolls are commensurate with the rates shown.

The tolls were calculated assuming 28.6 cents per mile for passenger cars and were rounded to the nearest 25-cent value to facilitate cash transactions in the initial years of operation. Note that for each axle classification except the 2-axle group at the ramp plazas, the rates are set to whole dollar amounts to facilitate the collection of tolls. While termination of the cash option may occur at some point in the future, the proposed toll rates for all horizon years are maintained at whole dollar values.

Table 6-2 provides a listing of the tolls by pay point for each year in which periodic toll increases are assumed. The assumed increases of the proposed toll plan are structured to double the initial toll rates by 2036, which implies a compounded annual growth rate of approximately 3.5 percent. The increases are applied at five-year intervals beginning in 2021 and continue for the entire 40-year horizon period. Under this plan, the 2-axle rate at the Middletown plaza would increase to $5.00 in 2021, $6.00 in 2026, $7.00 in 2031 and $8.00 in 2036. For extending the revenue forecasts beyond 2036, it is assumed that the 2-axle tolls would be increased by $1.00 every five years, reaching $12.00 in 2056. The tolls for multi-axle vehicles would be increased proportionately. This incremental approach to future toll increases would result in a tapering escalation rate, in percentage terms, over time.

6.2 Toll Collection Policy

The toll collection policy for the US 301 Mainline Toll Road reflects the Department's desire to operate the facility with the same payment methods available on the Delaware Turnpike. This decision reflects concerns about the loss of potential patrons and revenue if the roadway is operated as all electronic tolling (AET), particularly in the early years of operation. In order to maximize the potential revenue from interstate patrons, a decision was made to permit cash and transponder payment methods at the mainline barrier plaza and each of the ramp barriers. Note that the mainline barrier will have manned toll booths while the ramp plazas will provide automated coin machines.

Table 6-2
US 301 Mainline Tolls by Project Year, 2015-2056

Year	Mainline Barrier		Levels Road Ramps		Summit Bridge Road Ramps		Jamison Corner Road Ramps	
	2-Axle	5-Axle	2-Axle	5-Axle	2-Axle	5-Axle	2-Axle	5-Axle
2015	$4.00	$11.00	$1.00	$10.00	$0.75	$10.00	$0.50	$10.00
2021	$5.00	$14.00	$1.25	$13.00	$0.75	$13.00	$0.50	$13.00
2026	$6.00	$17.00	$1.50	$15.00	$1.00	$15.00	$0.50	$15.00
2031	$7.00	$19.00	$1.75	$18.00	$1.00	$18.00	$0.75	$18.00
2036	$8.00	$22.00	$2.00	$20.00	$1.50	$20.00	$0.75	$20.00
2041	$9.00	$25.00	$2.25	$23.00	$1.50	$23.00	$0.75	$23.00
2046	$10.00	$28.00	$2.50	$25.00	$1.75	$25.00	$1.00	$25.00
2051	$11.00	$30.00	$2.75	$28.00	$1.75	$28.00	$1.00	$28.00
2056	$12.00	$33.00	$3.00	$30.00	$2.00	$30.00	$1.00	$30.00

Similar to the toll policy on the Delaware Turnpike, no toll discounts for payment by transponders would be applied to the rates for US 301 Mainline Toll Road.

7 HORIZON YEAR BACKGROUND HIGHWAY ASSUMPTIONS

Stantec reviewed and confirmed future highway network improvement projects to be included in the background networks. As part of this effort, Stantec confirmed the configuration and anticipated completion date of all relevant projects for the specific horizon years in the forecast period. The final list of projects and most probable completion dates were obtained from the DelDOT, WILMAPCO, and Maryland SHA. Stantec also coordinated with RK&K regarding all local roadway improvements that might have an impact on the project.

7.1 Project Improvements

As part of the future year estimation process, model networks and trip tables were developed for five horizon years (2015, 2021, 2026, 2031, and 2036). These years correspond to the planned opening year of the US 301 Mainline Toll Road and the years where planned toll increases are anticipated. For each modeled network, Stantec coded the committed and planned improvements to the highway network based on projects identified in the DelDOT's Statewide Regional Long-Range Transportation Plan, published in October 2010, as well as other sources such as:

- State of Delaware Department of Transportation – Capital Transportation Program Fiscal Years 2011-2016, published in September 2010.
- Dover/Kent County Metropolitan Planning Organization Regional Transportation Plan: A Long Range Transportation Plan for 2030.
- Delaware Statewide Transportation Plan Update, List of Regionally Significant Projects included in Travel Demand model for Conformity, February 16, 2010.

The planned transportation improvements within the future year highway networks included those associated with the SR 1, I-95 and US 301 corridors as well as other locations where significant improvements are anticipated.

From the various public source websites the configuration and anticipated completion dates were obtained. For several projects, opening dates were not provided but could be inferred by anticipated construction funding. For Maryland, Stantec utilized the projects identified in publically available reports, such as "*Maryland DOT – Consolidated Transportation Program FY2011 – 2016*" (published in 2010) and "*WILMAPCO (New Castle, DE and Cecil County, MD) 2040 Regional Transportation Plan*" (published in

January 2011). Using this information, the completion dates and configuration for all projects in Maryland were established. As part of future project improvements, Stantec obtained information about local roadway improvements immediately adjacent to the US 301 Mainline Toll Road alignment that are not included in DelDOT's or WILMAPCO's capital improvement plans from RK&K. These projects would potentially include committed improvements being constructed by developers as part of the access approval process.

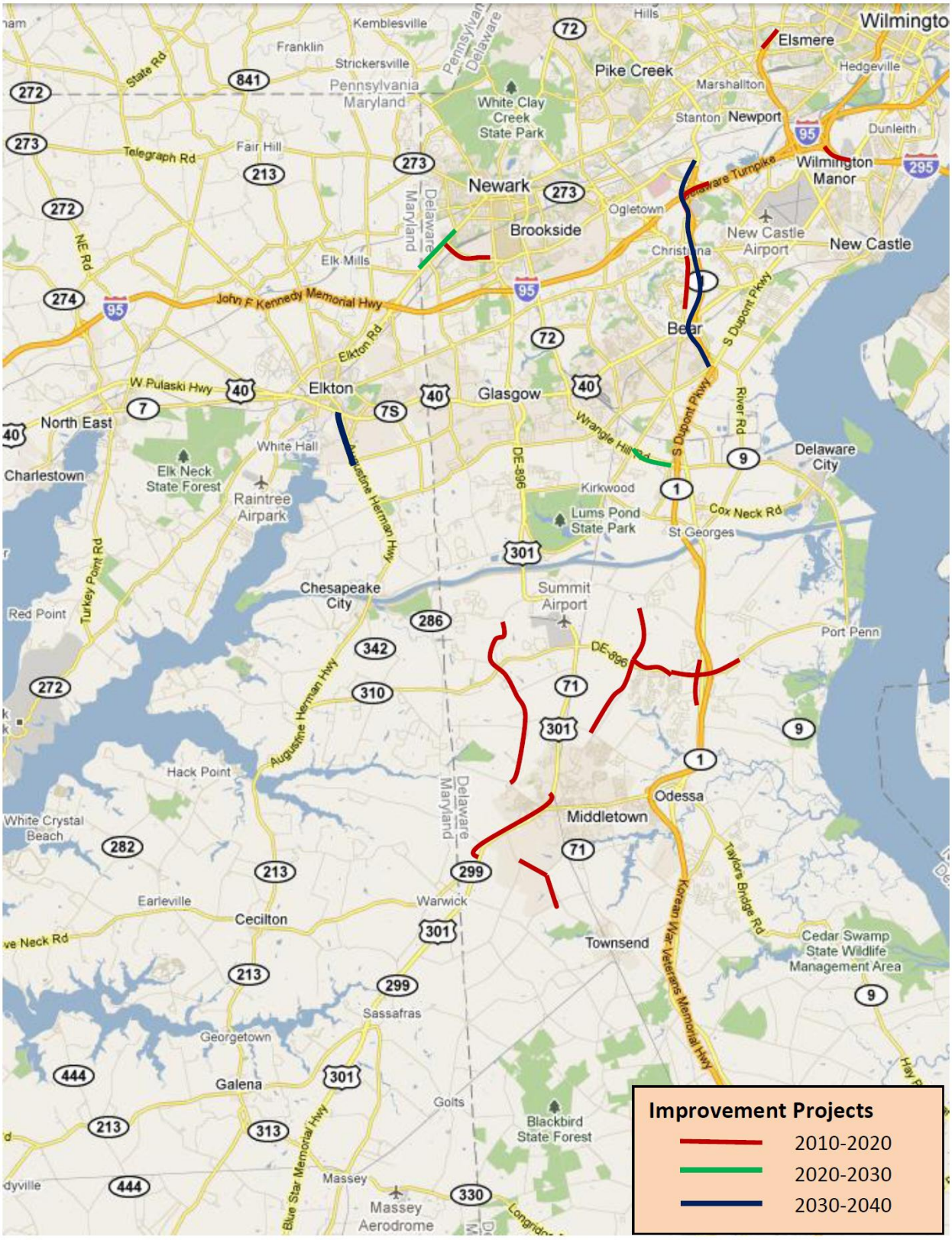
Table 7-1 and Figure 7-1 show the major highway improvements within the corridor in both Delaware and Maryland. The Delaware projects are mostly funded and constructed in the near-term horizon years while most of the Maryland projects are anticipated to be completed in more distant horizon years as noted in the respective long-range plans. The list of projects and most probable completion dates were obtained from the public sources provided by DelDOT, WILMAPCO, and Maryland SHA. Note that the list does not include many minor roadway improvements that provide only localized improvements in traffic flow and therefore do not directly compete with the US 301 Mainline Toll Road. The major projects listed in Table 7-1 along with other minor projects are included in the future background networks as appropriate.

In Table 7-1, DelDOT's program to make major improvements to I-95/Delaware Turnpike includes the reconfiguring of the I-95/SR 1 interchange at Christiana and the Christiana Mall (by 2014), and the conversion of the Newark toll plaza to include three high-speed *E-ZPass* lanes in each direction by 2012. In addition, the critical section of SR 1, south of I-95 south to Tybouts Corner, has experienced growing congestion and will need to be improved in the future. The need will be particularly acute when the US 301 Mainline Toll Road ties into SR 1 (south of the C&D Canal) in FY 2015. Currently, this improvement project is now beginning environmental analysis and its funding has not yet been identified. Discussions with the project team indicate that its earliest possible implementation is most likely the year 2025. Due to the uncertainty of the project's funding, for purposes of this analysis Stantec has assumed that the project will be complete by 2040. If this project were to be completed earlier than 2040, it would likely have a positive impact on the US 301 Mainline Toll Road.

Table 7-1
Project Improvements in Study Area

Project Name	Project Limit		Estimated Completion Year	Project Description
	From	To		
I-95 Delaware Turnpike	SR 1 Interchange	SR 141 Interchange	2009	Widen I-95 from 8 lanes to 10 lanes
School Bell Road	US 40	SR 7	2009	Widen travel lanes and shoulder
Bunker Hill Road	US 301	Choptank Road	2009	Reconstruction to provide two 11-foot travel lanes, 5-foot shoulders, and sidewalks
Levels Road	US 301	Industrial Drive	2009	Reconstruction to provide two 12-foot travel lanes, 8-foot shoulders
Boyds Corner Road (SR 896)	Greylag Road	Augustine Creek Bridge	2010	Construction of auxiliary on the Boyds Corner Road approach and the US 13 aaproach
Choptank Road (SR 15)	Bunker Hill Road	Bethel Church Road	2010	Widen the current 18-foot travel way to two 11-foot lanes
SR 141	Kirkwood Highway	Faulkland Road	2010	Conversion of the existing four-lane arterial without shoulder to a four-lane divided arterial with an 18-foot raised median
US 301	Middle Neck Road	Peterson Road	2010	Widen from 2 lanes to 4 lanes
St. Annes Church Road	Levels Road	Wiggins Mill Road	2011	Reconstruction to provide two 11-foot travel lanes and 5-foot shoulders
I-295	I-95 Interchange	US 13 Interchange	2011	New Collector/Distributor ramp and barrier at the southbound I-95 to eastbound I-295
SR 7	Newtown Road	SR 274	2013	Widening from two to four travel lanes
Jamison Corner Road	Boyds Corner Road	Hyetts Corner Road	2013	Reconstruction to provide two 12-foot lanes with 8-foot shoulders
Wiggins Mill Road	Green Giant Road	St. Annes Church Road	2013	Reconstruction to provide two 11-foot travel lanes and 5-foot shoulders
I-95 / US 202 Interchange	at Exit 8		2014	Extension of the current one-lane ramp to two-lane ramp from I-95 Northbound to US 202 Northbound
I-95 / SR 1 Interchange	at Exit 4		2014	Construction of a new multi-lane interchange from NB SR 1 to NB I-95 and SB I-95 to SB SR 1
Boyds Corner Road (SR 896)	Cedar Lane Road	US 13	2015	Widen Boyds Corner Road to four 12-foot lanes with 10-foot shoulders and 20-foot median
Cedar Lane Road	Marl Pit Road	Boyds Corner Road	2015	Reconstruction to provide two 12-foot lanes with 8-foot shoulders
Christiana Parkway (SR 4)	Elkton Road (SR 2)	SR 896	2015	Widen eastbound lanes from one to two lanes
SR 72	McCoy Road	SR 71	2020	Widen SR 72 from two to four travel lanes
Elkton Road (SR 2)	Maryland State Line	Casho Mill Road	2020	Capacity improvement on Elkton Road
MD 213	Frenchtown Road	US 40	2030	Widen from 2 lanes to 4 lanes
SR 1	Tybouts Corner	SR 273 (Christiana Rd)	2040	Widen from 4 lanes to 6 lanes

Figure 7-1
Highway Project Improvements



7.2 Future Year Toll Policy Assumptions

Table 7-2 lists the current and future year toll rates assumed for the toll plazas on the competing toll path along the I-95 corridor. Under current conditions the I-95 path requires tolls that significantly exceed the tolls encountered on the US 301 Corridor which currently requires tolls only at the Chesapeake Bay Bridge. In developing the current forecasts, it was assumed that tolls would escalate both along the I-95 corridor and SR-1 in Delaware. As noted previously in Chapter 6, the toll rates for the US 301 Mainline Toll Road were structured to be nearly identical to the toll rates assessed at the Newark Plaza on the Delaware Turnpike. In keeping with this assumption, the same years for periodic toll increases were assumed for the US 301 Mainline Toll Road and the Turnpike. Future year toll rates increases for SR-1 were set on a different schedule reflecting the different characteristics of travelers in that corridor. Tolls for the US 301 Mainline Toll Road are structured to escalate at an annual compounded rate of 3.5 percent for the first 20 years of operation with planned increases approximately every 5 years. The percentage increases for the Turnpike are nearly identical with the exception of the autos since the 2015 auto rate would be $5.00 as opposed to $4.00 for the US 301 Mainline Toll Road. Over the longer term, tolls on the Delaware Turnpike would be continue to increase in a coordinated pattern with the increased tolls on the US 301 Mainline Toll Road. Note that all toll increases are assumed to occur on January 1st of the stated year.

Within Maryland the years for periodic toll increases and the escalated rates were established using recently approved toll rate increases for FY 2012 and FY 2014 and general assumptions for the timing and increases beyond the near-term period. The recently-approved toll rates for FY 2012 increased cash tolls by approximately 20 percent at the I-95 JFK Toll Plaza and 44 percent for the Chesapeake Bay Bridge. For FY 2014, toll rates will increase 33 percent at the JFK Toll Plaza and 50 percent at the Chesapeake Bay Bridge. Beyond 2014, tolls were assumed to escalate at approximately 3.5 percent which is similar to the general trend of the most recent increase on the MdTA toll facilities. The assumed escalation rate of 3.5 percent is generally consistent with the historical growth in median household income obtained from the Maryland State Data Center. For the Eastern Shore counties the median household income increased at a compounded rate of 3.2% for the 20-year period between 1989 and 2009. The years for proposed increases on the Maryland toll facilities beyond 2014 were assumed to be consistent with the years designated for toll increases on the Delaware Turnpike and US 301.

Table 7-2
Background Network Toll Rates

Year	AUTO					TRUCK				
	DELAWARE		MARYLAND			DELAWARE		MARYLAND		
	US 301 Mainline Barrier[1]	I-95 Newark Toll Plaza[2]	I-95 Kennedy Highway[3][7]	I-95 Fort McHenry Tunnel[4][7]	US 50/301 Bay Bridge[5][7]	US 301 Mainline Barrier[1]	I-95 Newark Toll Plaza[2]	I-95 Kennedy Highway[3][7]	I-95 Fort McHenry Tunnel[4][7]	US 50/301 Bay Bridge[5][7]
2010		$4.00	$5.00	$2.00	$2.50		$9.00	$30.00	$12.00	$15.00
2011		$4.00	$6.00	$3.00	$4.00		$9.00	$36.00	$18.00	$24.00
2012		$4.00	$6.00	$3.00	$4.00		$9.00	$36.00	$18.00	$24.00
2013		$4.00	$8.00	$4.00	$6.00		$9.00	$48.00	$24.00	$36.00
2014		$4.00	$8.00	$4.00	$6.00		$9.00	$48.00	$24.00	$36.00
2015	$4.00	$5.00	$8.50	$4.25	$6.50	$11.00	$11.00	$51.50	$25.75	$38.50
2016	$4.00	$5.00	$8.50	$4.25	$6.50	$11.00	$11.00	$51.50	$25.75	$38.50
2017	$4.00	$5.00	$8.50	$4.25	$6.50	$11.00	$11.00	$51.50	$25.75	$38.50
2018	$4.00	$5.00	$8.50	$4.25	$6.50	$11.00	$11.00	$51.50	$25.75	$38.50
2019	$4.00	$5.00	$8.50	$4.25	$6.50	$11.00	$11.00	$51.50	$25.75	$38.50
2020	$4.00	$5.00	$8.50	$4.25	$6.50	$11.00	$11.00	$51.50	$25.75	$38.50
2021	$5.00	$6.00	$10.50	$5.25	$8.00	$14.00	$14.00	$63.25	$31.50	$47.50
2022	$5.00	$6.00	$10.50	$5.25	$8.00	$14.00	$14.00	$63.25	$31.50	$47.50
2023	$5.00	$6.00	$10.50	$5.25	$8.00	$14.00	$14.00	$63.25	$31.50	$47.50
2024	$5.00	$6.00	$10.50	$5.25	$8.00	$14.00	$14.00	$63.25	$31.50	$47.50
2025	$5.00	$6.00	$10.50	$5.25	$8.00	$14.00	$14.00	$63.25	$31.50	$47.50
2026	$6.00	$7.00	$12.50	$6.25	$9.50	$17.00	$17.00	$75.00	$37.50	$56.25
2027	$6.00	$7.00	$12.50	$6.25	$9.50	$17.00	$17.00	$75.00	$37.50	$56.25
2028	$6.00	$7.00	$12.50	$6.25	$9.50	$17.00	$17.00	$75.00	$37.50	$56.25
2029	$6.00	$7.00	$12.50	$6.25	$9.50	$17.00	$17.00	$75.00	$37.50	$56.25
2030	$6.00	$7.00	$12.50	$6.25	$9.50	$17.00	$17.00	$75.00	$37.50	$56.25
2031	$7.00	$8.00	$14.75	$7.50	$11.25	$19.00	$19.00	$89.25	$44.50	$66.75
2032	$7.00	$8.00	$14.75	$7.50	$11.25	$19.00	$19.00	$89.25	$44.50	$66.75
2033	$7.00	$8.00	$14.75	$7.50	$11.25	$19.00	$19.00	$89.25	$44.50	$66.75
2034	$7.00	$8.00	$14.75	$7.50	$11.25	$19.00	$19.00	$89.25	$44.50	$66.75
2035	$7.00	$8.00	$14.75	$7.50	$11.25	$19.00	$19.00	$89.25	$44.50	$66.75
2036	$8.00	$9.00	$17.75	$8.75	$13.25	$22.00	$22.00	$106.00	$53.00	$79.50
2037	$8.00	$10.00	$17.75	$8.75	$13.25	$22.00	$22.00	$106.00	$53.00	$79.50
2038	$8.00	$10.00	$17.75	$8.75	$13.25	$22.00	$22.00	$106.00	$53.00	$79.50
2039	$8.00	$10.00	$17.75	$8.75	$13.25	$22.00	$22.00	$106.00	$53.00	$79.50
2040	$8.00	$10.00	$17.75	$8.75	$13.25	$22.00	$22.00	$106.00	$53.00	$79.50
2041	$9.00	$10.00	$21.00	$10.50	$15.75	$25.00	$25.00	$125.75	$63.00	$94.25
2042	$9.00	$11.00	$21.00	$10.50	$15.75	$25.00	$25.00	$125.75	$63.00	$94.25

Note:
(1) It is assumed that US 301 Toll Connector Road would be opened in July, 2015.
(2) I-95 auto and truck tolls at the Newark Plaza were increased in 1991 and 2000 as well as on October 1, 2005 and October 1, 2007.
(3) I-95 auto tolls for the John F. Kennedy Memorial Highway were increased on October 8, 1991, November 1, 2001, and November 15, 2003. Truck tolls were also increased on May 1, 2009. Tolls are collected northbound only
(4) I-95 auto and truck tolls at the Fort McHenry Tunnel were increased on July 1, 1989, and November 15, 2003. Truck Tolls were also increased on May 1, 2009. Tolls are collected in both directions.
(5) US 50/301 auto and truck tolls in Maryland were increased on April 2, 1989. Truck tolls were also increased on May 1, 2009. Tolls for US 50/301 Bay Bridge are collected eastbound only.
(6) Toll increases are assumed at general rate of 3.5% annually. This rate is above the general rate of inflation which is 2.7% using CPI growth during 1997-2009 for the Northeast Region.
(7) Toll rates for Maryland will increase in 2011 and 2013.

In comparing the rates for the long-distance trips via US 301 and I-95, it is important to note that the US 301 routing will maintain a lower overall toll cost when considering the total cost of all the paypoints on the I-95 routing. Table 7-3 lists the total toll costs for cash patrons using either route for several horizon years. As shown in the table, cost savings for the US 301 Mainline Toll Road are increasing as the over time, providing a competitive advance over the I-95 routing through Maryland.

Table 7-3
Comparison of Toll Cost by Path and Vehicle Type

Year	Auto Tolls			5-Axle Truck Tolls		
	I-95	Bay Bridge / US 301	Cost Savings	I-95	Bay Bridge / US 301	Cost Savings
2015	$ 17.75	$ 10.50	$ 7.25	$ 88.25	$ 49.50	$ 38.75
2021	$ 21.75	$ 13.00	$ 8.75	$ 108.75	$ 61.50	$ 47.25
2031	$ 30.25	$ 18.25	$ 12.00	$ 152.75	$ 85.75	$ 67.00
2041	$ 41.50	$ 24.75	$ 16.75	$ 213.75	$ 119.25	$ 94.50

7.3 Local Road Truck Prohibitions

In order to restrict trucks from using local roadways in Maryland and Delaware to by-pass the mainline toll plaza, DelDOT and Maryland SHA have agreed to implement a series of truck prohibitions on the adjacent local roadways. In addition to enforcing the provision for tolling long-distance truck trips, these prohibitions also reflect safety concerns as well as geometric and weight limitations of these local roads. Table 7-4 provides a list of the proposed locations of truck prohibitions.

Table 7-4
Local Road Truck Restrictions

ROAD NAME	LIMIT		JURISDICTION
	FROM	TO	
Sassafras Caldwell Rd	MD 299	Caldwell Corner Road	Maryland
Edgar Price Road	MD 299	Levels Road	Delaware, Maryland
Wards Hill Road	MD 282	MD 299	Maryland
Strawberry Lane	DE 15	MD 299	Delaware, Maryland
DE 15 (Levels Road)	Strawberry Lane	St. Annes Church Road	Delaware
DE 299 (Warwick Road)	Old Telegraph road	Middle Neck Road	Delaware, Maryland
Middle Neck Road	Old Telegraph road	DE 299	Delaware, Maryland
Old Telegraph Road	MD 299	Middle Neck Road	Maryland
Bunker Hill Road	Old Telegraph road	Choptank Road	Delaware, Maryland

Note that beyond these prohibitions are current weight restrictions and geometric constraints on several of the local roadways which could serve as potential bypasses of the mainline toll plaza. The traffic and revenue forecasts developed herein are based on the assumption that these truck prohibitions will be established and enforced in addition to the existing limitations on vehicle weights.

8 TRAFFIC FORECASTS

Utilizing the revised socioeconomic data sets provided by ATG in Chapter 5 and the updated future highway networks developed in Chapter 7, Stantec executed the DelDOT's Regional Model to forecast future travel within the corridor by horizon year. The model was executed for the selected horizon years required for the forecasting process. The specific horizon years include the opening year 2015 and the year 2041. Additional interim years were included as necessary as a function of the project staging and the specific years when periodic toll increases were scheduled. Stantec reviewed the results of the model execution to ensure that the results in the corridor are reasonable.

8.1 Daily Toll Transactions

Using the validated toll diversion model along with the anticipated growth in the socioeconomic data and the planned transportation improvements in the DelDOT Regional Model, Stantec developed traffic and revenue forecasts for the US 301 Mainline Toll Road, taking into account the initial (2015) toll schedule and the periodic toll increases in 2021, 2026, 2031, 2036 and 2041. The forecast period (2015-2041) reflects the model's five horizon years ending with 2041.

Beyond 2041, the projected twentieth year of operation, revenues were projected out to 2055, the fortieth year of operation, with tolls continuing to increase every five years to reach $12.00 for autos and $33.00 for 5-axle trucks by 2056. The development of the traffic and revenue estimates for the non-modeled years from 2015 through 2041 were performed with standard interpolation techniques. After 2041, the forecast was based on a linear extrapolation using the growth from the last 10 years of the modeled period which results in a tapering traffic growth rate (in percentage terms) over time.

Toll evasion for cash and ETC tolling options was included in the forecast as noted in Section 9.4. A moderate ramp-up factor of 90 percent (traffic discounted by 10 percent) for the first year of operation (increasing to 100 percent by 2017) reflects the fact that US 301 is an established traffic corridor.

Table 8-1 shows the estimated 2015 transactions by paypoint on a daily basis and the revenue for the July – December period. Note that the revenue from the mainline barrier and its large portion of truck trips provides the majority of the revenue for the facility.

Table 8-1
US 301 Mainline Forecast for Base Toll Option, 2015

Toll Location	Transactions[A]	Average Toll	Revenue[B] (000)
Mainline Barrier	11,270	$5.39	$10,778
Levels Road Ramps	2,440	$1.30	$565
Summit Bridge Road Ramps	4,140	$1.13	$831
Jamison Corner Road Ramps	1,660	$0.62	$183
Total	19,510	$3.57	$12,357

(A) Discounted by toll evasion and ramp-up in 2015

(B) Revenue for half-year (July - December) based on assumed opening, July 2015

Table 8-2 provides a similar summary of transactions and revenue for each of the modeled years out to 2041. Note that the truck share of overall revenue is approximately 40 to 45 percent over the forecast period. This is attributed to the large share of truck traffic at the mainline barrier and the associated toll rates paid by trucks. It should be noted the majority of transactions at the mainline barrier are out-of- state travelers, the transactions at the ramp plazas are more locally oriented and thus dominated by local travelers. While the Levels Road ramp plazas are a mixture of local residents from adjacent communities in Maryland and Delaware residents, the ramp plazas at Summit Bridge Road and Jamison Corner Road serve predominately local Delaware residents and businesses.

As shown in Table 8-2, given the toll plan and the higher level of truck transactions at the mainline toll plaza, the dominant share of revenue is related to tolls collected at the mainline plaza. Over the forecast period approximately 87 percent of the total revenue is obtained from vehicles at the malinline barrier, many of which are long-distance trips. Note also that truck tolls generate approximately 40 to 47 percent of the total revenue for the facility.

Table 8-2
Daily Transactions and Revenue by Model Horizon Year

Toll Location	Daily Transactions																	
	2015			2021			2026			2031			2036			2041		
	Auto	Truck	Total	Auto	Truck	Total	Auto	Truck	Total	Auto	Truck	Total	Auto	Truck	Total	Auto	Truck	Total
Mainline Barrier	8,600	2,670	11,270	11,220	3,500	14,720	13,010	3,940	16,950	13,080	4,400	17,480	14,110	4,920	19,030	15,290	5,550	20,840
Levels Road Ramps	2,340	100	2,440	3,330	190	3,520	3,770	230	4,000	4,030	260	4,290	4,250	290	4,540	4,500	310	4,810
Summit Bridge Road Ramps	3,930	210	4,140	4,320	260	4,580	4,290	290	4,580	4,390	290	4,680	4,400	330	4,730	4,550	340	4,890
Jamison Corner Road Ramps	1,630	30	1,660	2,350	50	2,400	2,790	70	2,860	2,820	80	2,900	3,250	100	3,350	3,870	110	3,980
Total	16,500	3,010	19,510	21,220	4,000	25,220	23,860	4,530	28,390	24,320	5,030	29,350	26,010	5,640	31,650	28,210	6,310	34,520

Toll Location	Annual Revenue ($1,000)																	
	2015			2021			2026			2031			2036			2041		
	Auto	Truck	Total	Auto	Truck	Total	Auto	Truck	Total	Auto	Truck	Total	Auto	Truck	Total	Auto	Truck	Total
Mainline Barrier	$6,109	$4,669	$10,778	$19,919	$15,456	$35,375	$27,720	$21,154	$48,874	$32,504	$26,594	$59,098	$40,084	$34,401	$74,485	$48,855	$44,000	$92,854
Levels Road Ramps	$415	$150	$565	$1,479	$717	$2,196	$2,006	$1,020	$3,027	$2,504	$1,391	$3,895	$3,015	$1,735	$4,750	$3,591	$2,140	$5,731
Summit Bridge Road Ramps	$523	$309	$831	$1,149	$1,007	$2,156	$1,522	$1,303	$2,825	$1,557	$1,563	$3,120	$2,342	$1,944	$4,287	$2,423	$2,304	$4,728
Jamison Corner Road Ramps	$144	$39	$183	$417	$182	$599	$495	$292	$787	$751	$435	$1,186	$865	$580	$1,446	$1,030	$754	$1,784
Total	$7,190	$5,167	$12,357	$22,965	$17,361	$40,326	$31,743	$23,769	$55,512	$37,315	$29,983	$67,298	$46,307	$38,660	$84,967	$55,899	$49,199	$105,098
Average Toll Per Transactions			$3.57			$4.50			$5.51			$6.46			$7.56			$8.58
Percent Truck Revenue			41.8%			43.1%			42.8%			44.6%			45.5%			46.8%
Mainline Revenue Share			**87.2%**			**87.7%**			**88.0%**			**87.8%**			**87.7%**			**88.4%**

8.2 Corridor Screenline Analysis / Diversion

Figure 8-1 displays two screenlines established to track the growth of traffic among the various roadways that would be influenced by the US 301 Mainline Toll Road. Screenline 1 intercepts all traffic crossing the C&D Canal and traffic for the base year 2009 and each modeled horizon year is listed in Figure 8-2. Traffic along the US 301 Corridor south of Middletown is intercepted on Screenline 2 and is listed in Figure 8-3.

Figure 8-1
Corridor Screenline Locations

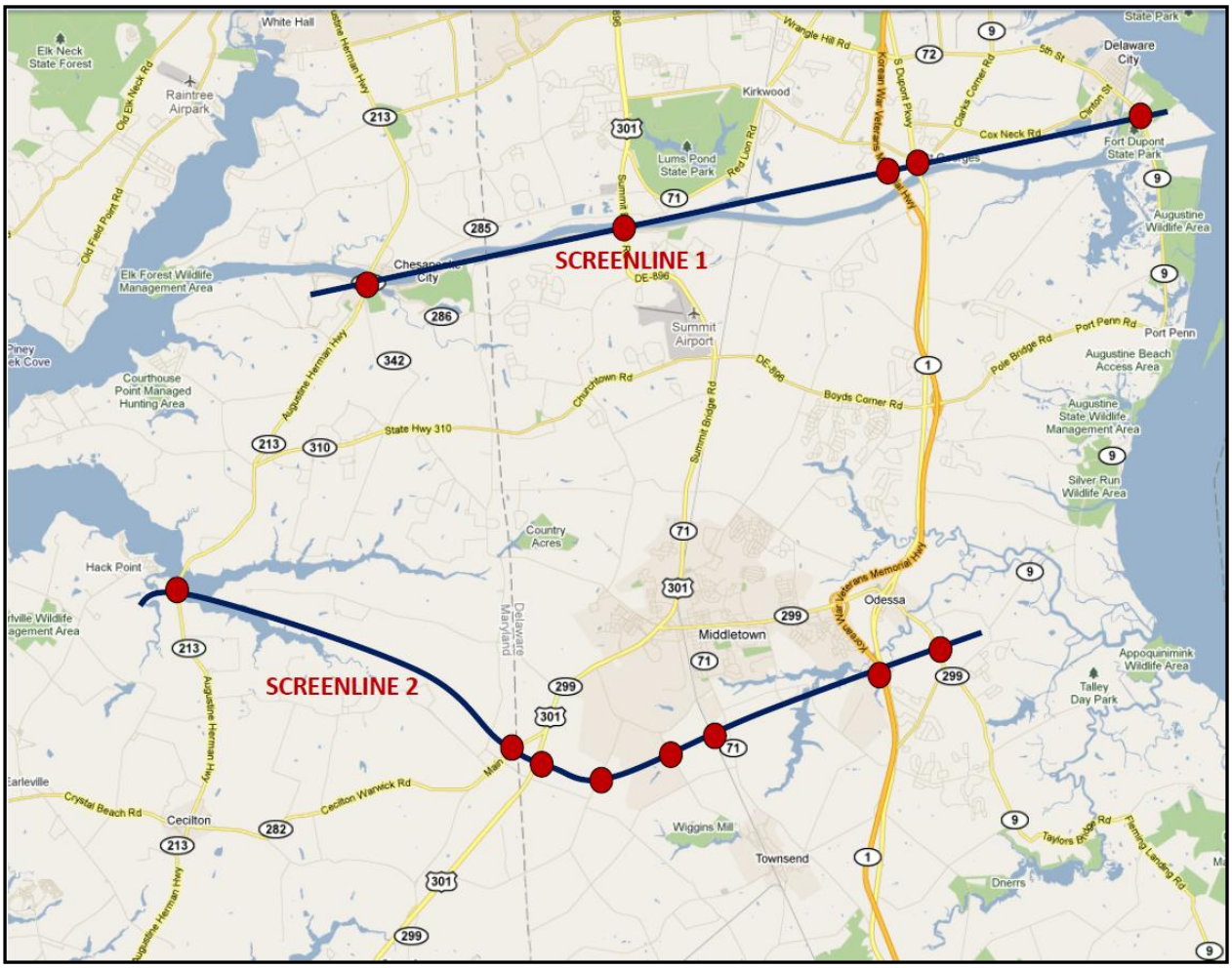
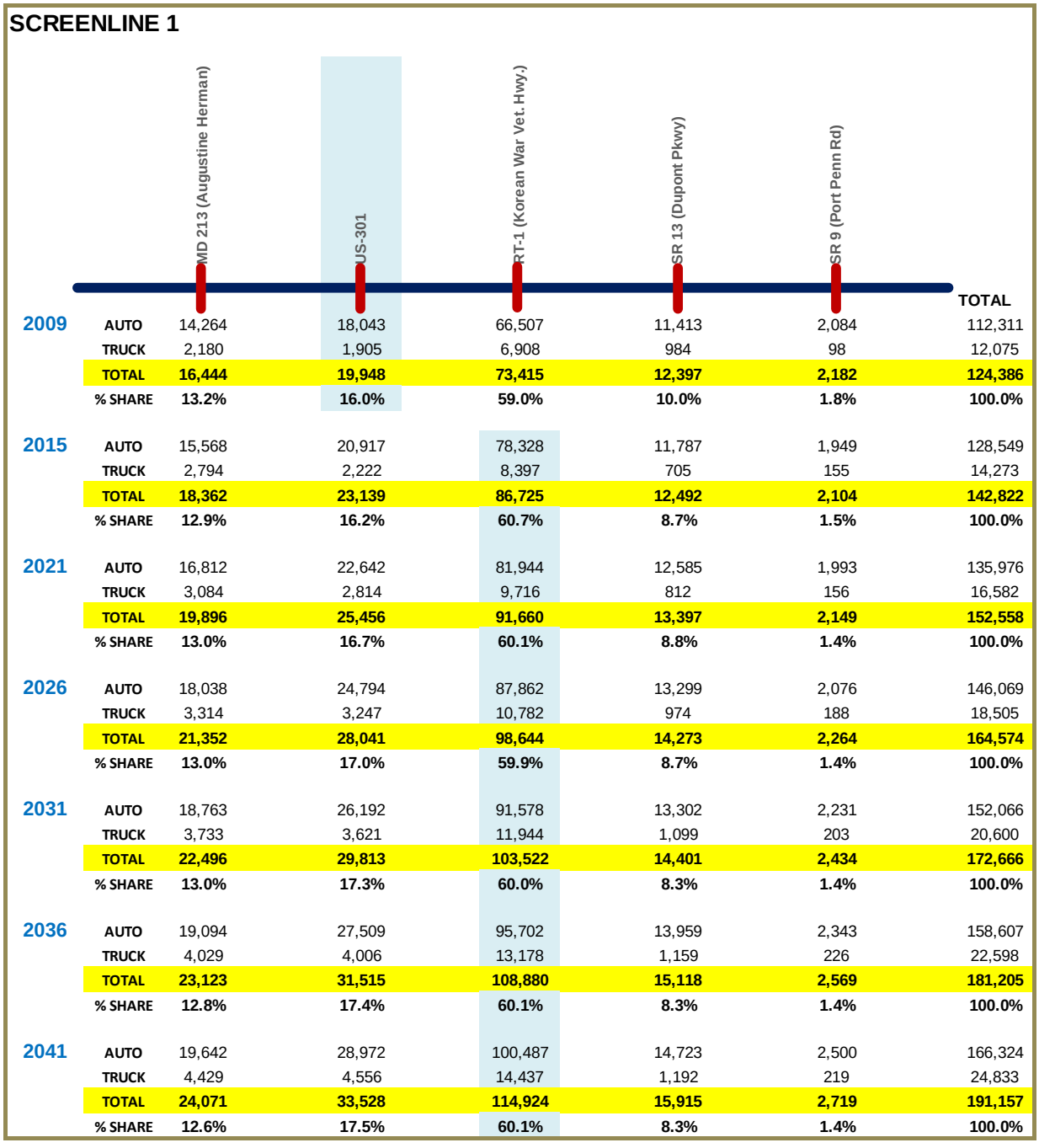
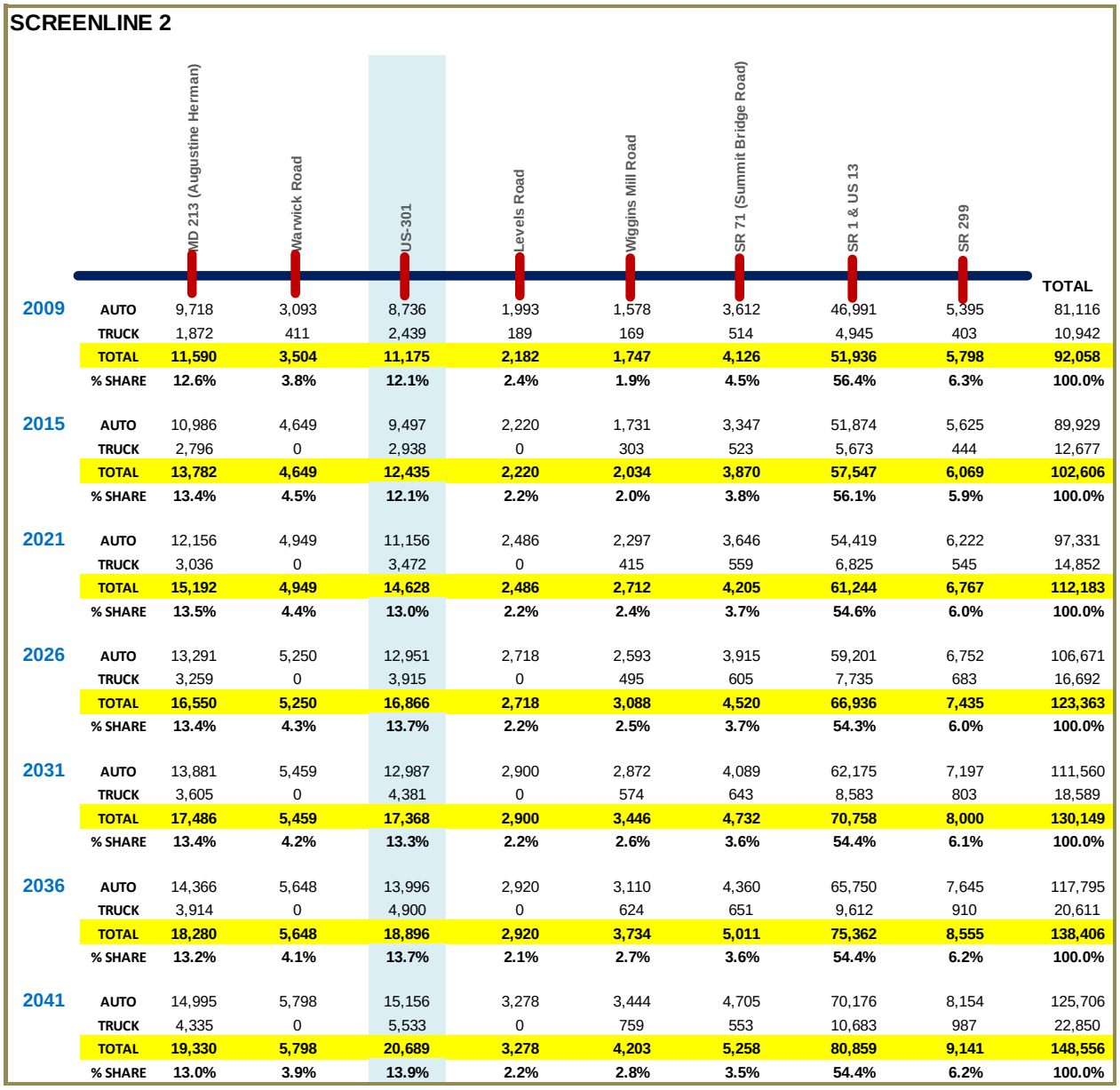


Figure 8-2
Daily Traffic Comparison by Analysis Year at Screenline 1



		MD 213 (Augustine Herman)	US-301	RT-1 (Korean War Vet. Hwy.)	SR 13 (Dupont Pkwy)	SR 9 (Port Penn Rd)	TOTAL
2009	AUTO	14,264	18,043	66,507	11,413	2,084	112,311
	TRUCK	2,180	1,905	6,908	984	98	12,075
	TOTAL	**16,444**	**19,948**	**73,415**	**12,397**	**2,182**	**124,386**
	% SHARE	**13.2%**	**16.0%**	**59.0%**	**10.0%**	**1.8%**	**100.0%**
2015	AUTO	15,568	20,917	78,328	11,787	1,949	128,549
	TRUCK	2,794	2,222	8,397	705	155	14,273
	TOTAL	**18,362**	**23,139**	**86,725**	**12,492**	**2,104**	**142,822**
	% SHARE	**12.9%**	**16.2%**	**60.7%**	**8.7%**	**1.5%**	**100.0%**
2021	AUTO	16,812	22,642	81,944	12,585	1,993	135,976
	TRUCK	3,084	2,814	9,716	812	156	16,582
	TOTAL	**19,896**	**25,456**	**91,660**	**13,397**	**2,149**	**152,558**
	% SHARE	**13.0%**	**16.7%**	**60.1%**	**8.8%**	**1.4%**	**100.0%**
2026	AUTO	18,038	24,794	87,862	13,299	2,076	146,069
	TRUCK	3,314	3,247	10,782	974	188	18,505
	TOTAL	**21,352**	**28,041**	**98,644**	**14,273**	**2,264**	**164,574**
	% SHARE	**13.0%**	**17.0%**	**59.9%**	**8.7%**	**1.4%**	**100.0%**
2031	AUTO	18,763	26,192	91,578	13,302	2,231	152,066
	TRUCK	3,733	3,621	11,944	1,099	203	20,600
	TOTAL	**22,496**	**29,813**	**103,522**	**14,401**	**2,434**	**172,666**
	% SHARE	**13.0%**	**17.3%**	**60.0%**	**8.3%**	**1.4%**	**100.0%**
2036	AUTO	19,094	27,509	95,702	13,959	2,343	158,607
	TRUCK	4,029	4,006	13,178	1,159	226	22,598
	TOTAL	**23,123**	**31,515**	**108,880**	**15,118**	**2,569**	**181,205**
	% SHARE	**12.8%**	**17.4%**	**60.1%**	**8.3%**	**1.4%**	**100.0%**
2041	AUTO	19,642	28,972	100,487	14,723	2,500	166,324
	TRUCK	4,429	4,556	14,437	1,192	219	24,833
	TOTAL	**24,071**	**33,528**	**114,924**	**15,915**	**2,719**	**191,157**
	% SHARE	**12.6%**	**17.5%**	**60.1%**	**8.3%**	**1.4%**	**100.0%**

Figure 8-3
Daily Traffic Comparison by Analysis Year at Screenline 2



		MD 213 (Augustine Herman)	Warwick Road	US-301	Levels Road	Wiggins Mill Road	SR 71 (Summit Bridge Road)	SR 1 & US 13	SR 299	TOTAL
2009	AUTO	9,718	3,093	8,736	1,993	1,578	3,612	46,991	5,395	81,116
	TRUCK	1,872	411	2,439	189	169	514	4,945	403	10,942
	TOTAL	**11,590**	**3,504**	**11,175**	**2,182**	**1,747**	**4,126**	**51,936**	**5,798**	**92,058**
	% SHARE	**12.6%**	**3.8%**	**12.1%**	**2.4%**	**1.9%**	**4.5%**	**56.4%**	**6.3%**	**100.0%**
2015	AUTO	10,986	4,649	9,497	2,220	1,731	3,347	51,874	5,625	89,929
	TRUCK	2,796	0	2,938	0	303	523	5,673	444	12,677
	TOTAL	**13,782**	**4,649**	**12,435**	**2,220**	**2,034**	**3,870**	**57,547**	**6,069**	**102,606**
	% SHARE	**13.4%**	**4.5%**	**12.1%**	**2.2%**	**2.0%**	**3.8%**	**56.1%**	**5.9%**	**100.0%**
2021	AUTO	12,156	4,949	11,156	2,486	2,297	3,646	54,419	6,222	97,331
	TRUCK	3,036	0	3,472	0	415	559	6,825	545	14,852
	TOTAL	**15,192**	**4,949**	**14,628**	**2,486**	**2,712**	**4,205**	**61,244**	**6,767**	**112,183**
	% SHARE	**13.5%**	**4.4%**	**13.0%**	**2.2%**	**2.4%**	**3.7%**	**54.6%**	**6.0%**	**100.0%**
2026	AUTO	13,291	5,250	12,951	2,718	2,593	3,915	59,201	6,752	106,671
	TRUCK	3,259	0	3,915	0	495	605	7,735	683	16,692
	TOTAL	**16,550**	**5,250**	**16,866**	**2,718**	**3,088**	**4,520**	**66,936**	**7,435**	**123,363**
	% SHARE	**13.4%**	**4.3%**	**13.7%**	**2.2%**	**2.5%**	**3.7%**	**54.3%**	**6.0%**	**100.0%**
2031	AUTO	13,881	5,459	12,987	2,900	2,872	4,089	62,175	7,197	111,560
	TRUCK	3,605	0	4,381	0	574	643	8,583	803	18,589
	TOTAL	**17,486**	**5,459**	**17,368**	**2,900**	**3,446**	**4,732**	**70,758**	**8,000**	**130,149**
	% SHARE	**13.4%**	**4.2%**	**13.3%**	**2.2%**	**2.6%**	**3.6%**	**54.4%**	**6.1%**	**100.0%**
2036	AUTO	14,366	5,648	13,996	2,920	3,110	4,360	65,750	7,645	117,795
	TRUCK	3,914	0	4,900	0	624	651	9,612	910	20,611
	TOTAL	**18,280**	**5,648**	**18,896**	**2,920**	**3,734**	**5,011**	**75,362**	**8,555**	**138,406**
	% SHARE	**13.2%**	**4.1%**	**13.7%**	**2.1%**	**2.7%**	**3.6%**	**54.4%**	**6.2%**	**100.0%**
2041	AUTO	14,995	5,798	15,156	3,278	3,444	4,705	70,176	8,154	125,706
	TRUCK	4,335	0	5,533	0	759	553	10,683	987	22,850
	TOTAL	**19,330**	**5,798**	**20,689**	**3,278**	**4,203**	**5,258**	**80,859**	**9,141**	**148,556**
	% SHARE	**13.0%**	**3.9%**	**13.9%**	**2.2%**	**2.8%**	**3.5%**	**54.4%**	**6.2%**	**100.0%**

The columns of numbers highlighted in blue in Figures 8-2 and 8-3 are the volumes of roadways at either end of the US 301 Mainline Toll Road.

Screenline 1 north of the project paralleling the C & D Canal indicates that there will be a noticeable diversion in 2015 to the SR-1 Bridge across the C&D Canal just above the merge point with the new toll road. This diversion is related to the improved travel times for accessing locations north of the canal provided by US 301 Mainline Toll Road and the fact that the US 301 route designation will be altered so the US 301 will now merge with SR-1 rather than use the existing alignment that is shared with SR-896 over the Summit Bridge. As a result, traffic on the existing US 301 alignment that uses the Summit Bridge shows a slightly lower rate of growth. The percentage shares of the other north-south roadways show only minimal changes in response to the new toll road.

Screenline 2 south of the project corridor identifies diversions for traffic south and west of Middletown. Traffic volumes on US 301 south of Middletown near the proposed mainline barrier continues to shows an increasing share of the overall corridor traffic in response to the reduced travel times provided by the new toll road. Note that several local roads indicate an increase in the share of corridor traffic. This increase is due to development growth and for some local traffic as these roads provide non-tolled routes into Middletown.

9 TOLL REVENUE ESTIMATES

Toll revenue forecasts for the proposed US 301 Mainline Toll Road were based on the tolled traffic estimated by the customized toll diversion model. Future year toll traffic forecasts were developed for the project opening year of 2015, 2021 and subsequent horizon years at 5-year intervals out to 2041. These horizon years were utilized to estimate the impact of scheduled toll increases, demographic growth and assumptions regarding the changes in background highway network. To develop the required 40-year toll revenue stream for the project, the toll transactions and toll revenue estimates for the intermediates years between model runs were estimated using straight-line interpolation. Transaction and toll revenue estimates for the years beyond the model horizon year of 2041 were developed using standard extrapolation techniques. The toll revenue estimates that are provided in this chapter are the gross annual toll revenue for the mainline toll facility and do not include revenue from the future Spur Road.

9.1 Toll Revenue Estimation Assumptions

As part of toll revenue estimation assumptions regarding evasion, general 'ramp-up', ETC shares, a truck axle factor, and an annualization factor were adopted as described in the following sections. All of these assumptions were developed using traffic characteristics obtained from within the US 301 corridor or from observed statistics from DelDOT's existing toll facilities.

9.1.1 Truck Axle Factors

The truck toll revenue estimates were developed by multiplying the truck toll transactions with the base 2-axle toll rate times an average truck axle factor. The truck axle multipliers were applied to the truck transactions by paypoint using the vehicle classification data at each toll facility of US 301, I-95, and SR 1. Table 9-1 lists truck axle factor for these major toll facilities within Delaware. Note that all vehicles with two-axle and six tires or greater than two axles are defined as trucks in the modeling process. However, for toll revenue calculations, two-axle and six-tire trucks are charged the same tolls as autos. For the US 301 Mainline Toll Road, a truck axle factor of 2.46 was derived by using the truck count data at new permanent counter on US 301 at the state line that was installed in 2008 and the truck toll rate values in the adopted toll policy.

Table 9-1
Truck Axle Factor by Toll Plaza

Toll Facility Location	Truck Axle Factor
US 301 Connector (1)	2.46
I-95 Newark Plaza (2)	1.90
SR 1 Biddle Plaza (2)	3.42
SR 1 Dover Toll Plaza (2)	3.36

(1) 2009 average Weekday Traffic Count from ATR 8025 (US 301 at MD/DE State Line)
(2) 2009 Average Daily Toll Transactions

The I-95 Newark toll plaza has a lower truck axle factor of 1.90 when compared to 3.36 and 3.42 factors at SR 1 mainline toll facilities (Biddles and Dover plazas). The variation in the factors reflects the relationship between the auto and truck tolls on each facility As an example, the I-95 Newark toll rates ($4.00 per 2-axle & $9.00 per 5-axle) have a lower ratio than the ratio of auto and truck tolls on SR 1 ($1.00 per 2-axle & $5.00 per 5-axle). The composition of trucks, in terms of the number of vehicles in each truck axle group, also contributed to some of the differences in the truck multiplier factors.

9.1.2 Annualization Factor

The annual toll revenue estimates were developed by using an annualization process that calculates “annual toll revenue days” and converts weekday transaction estimates to an equivalent value of annual revenue. In order to determine an annualization factor for the US 301 Mainline Toll Road, Stantec utilized permanent traffic count data from DelDOT for the count station on US 301 at the state line. Since the weekend periods show a higher level of auto traffic than truck traffic and given the differences in the toll rates by vehicle type, a blended factor of 360.8 for the mainline plaza was estimated initially. This factor was then reduced to account for the contribution of toll revenue at the ramp plazas which is assumed to have a significantly lower weekend usage. It was assumed that the daily ‘weekend” traffic and revenue would be approximately 60% of the weekday traffic at the ramp plaza. A composite factor of 355.0 was derived from these calculations and applied the daily revenue estimates to generate annual values.

Table 9-2
Annual Day Factor

MAINLINE ONLY

Vehicle Type	Revenue Percent	Annualization	
		Factor	Factor * %
Truck	43.4%	315.0	136.8
Auto	56.6%	396.0	224.0
Total	100.0%		360.8

SYSTEM TOTAL

Plaza Type	Revenue Percent	Annualization	
		Factor	Factor * %
Mainline	87.1%	360.8	314.3
Ramps	12.9%	319.0	41.2
Total	100.0%		355.4

Annualization is assumed as 355.0

9.1.3 Ramp-Up Factors

Ramp-up is a term used to describe the period from when a toll road first opens to traffic until it achieves the steady-state traffic flows predicted by the travel demand model. It accounts for the time needed for toll paying customers to find and become acquainted with the project, and to decide whether it offers a good value proposition.

The initial toll revenue estimates for the early years of the project were reduced by applying ramp-up factors. Since the project is being built on an existing alignment and the travelers in the corridor are already familiar with the travel characteristics of the existing roads, a relatively short ramp-up period was assumed for the project. Table 9-3 lists the yearly ramp-up factors used. The ramp-up factors were applied only to the first two years of operation 2015 and 2016.

Table 9-3
Ramp-Up Factors

Year	Ramp-Up Factor
2015	90%
2016	95%
2017	100%

9.1.4 Toll Evasion Factors

The adjustment to the revenue estimates involved reducing the revenues to account for potential toll evasion. For this study, toll evasion rates by each toll payment type (Cash, and ETC) and toll paypoint type (mainline barrier or ramp) were adopted. The toll evasion rates were developed from available data and evasion experience from the Delaware Turnpike and SR-1. As listed in Table 9-4, the evasion rates for "open road tolling" configurations assumed for ETC transactions that involved high-speed recognition were higher than the evasion rates for cash transactions. Note that evasion for cash transactions for manned booths at the mainline barrier were set at 0.3% while the automated coin machines at the ramp toll plazas were assumed to have a 1.5% evasion rate. Toll evasion rates for autos and trucks were assumed to be the same.

Table 9-4
Toll Evasion Factors

Toll Payment Type	Mainline Plaza	Ramp Plaza
Cash	0.30%	1.50%
ETC	1.80%	1.80%

9.1.5 Transponder Tolling Assumptions

Assumptions regarding the percentage of traffic with ETC transponders in future years were developed based on the historical ETC usage data from other toll facilities across the country, in particular, the newly-opened sections of toll roads. Assumptions regarding opening-year ETC shares are based on the traffic data in the existing US 301 corridor. The percentage of vehicles already equipped with transponders at the state line was obtained from the monitoring equipment placed at the new permanent count station, as shown previously in Table 3-3. In the period from 2008 through 2010, approximately 40 percent of the vehicles crossing the state line were equipped with transponders. It is anticipated that the introduction of a new toll facility and the competitive travel time saving it will provide with respect the I-95 corridor should induce a larger share of vehicles equipped with transponders.

Table 9-5 lists the assumed ETC percentages for the years for which model runs were conducted. The table shows the assumed ETC percentages by trip purposes and traffic modes. The ETC percentages for home-based work are higher than those of other purposes and truck. It should be noted that the vehicles without transponders were assumed to be pay via cash.

Table 9-5
Assumed ETC Transponder Percentage

Year	Auto ETC %	Truck ETC %
2015	62%	54%
2021	72%	62%
2026	75%	65%
2031	77%	66%
2036	77%	67%
2041	77%	67%

Note that the share of trucks with transponders is slightly less than the auto market. This reflects an assumption that many of the trucks using US 301 are attempting to minimize their toll costs and therefore these vehicles will be less likely to be equipped with a transponder.

9.1.6 Preparation of Fiscal Year Estimates

In this study, the toll revenue estimations were conducted under the calendar year basis for the project years from 2015 through-2055. Thus, in the calendar year analysis, the toll revenue for the assumed opening year, 2015 included only the six-month toll revenue because US 301 Mainline Toll Road will open in July 2015. The fiscal year runs from July 1st to June 30th of the following year. Stantec developed the process converting the calendar year toll revenue estimated into fiscal year values utilizing the conversion factors listed in Table 9-6. The conversion factors by auto and truck were derived from 2009 daily traffic counts in I-95 Newark Toll Plaza. The auto traffic showed a higher percentage as 52.7% in the second six-month period (July 1st – December 31st), but there was slightly higher share of truck traffic than auto traffic during the first six-month period (January 1st – June 30th).

Table 9-6
Fiscal Year Conversion Factors

Period	Auto	Truck
Jan - Jun	47.3%	50.8%
Jul - Dec	52.7%	49.2%

Source: 2009 Traffic Data at I-95 Newark Toll Plaza

9.2 Calendar Year Transaction and Revenue Estimates

Table 9-7 lists the daily toll transactions for US 301 Mainline Toll Road by vehicle type. For the period beyond the last model year of 2041, the annual growth rates in transaction were estimated using a customized approach that utilizes the trend in the growth in the final 10 years (2031-2041) of the model forecast and the elasticity of periodic toll increases applied at each 5-year interval. Tables 9-8 lists annual toll revenue estimates for US 301 Mainline Toll Road by vehicle type. The toll revenue estimates reported in this table are for calendar year and are in current year dollar terms. Note that for the early years, the growth in transactions and toll revenue are significant due to the application of the ramp-up factors. It is important to note that the annual revenue changes include the combined effect of both increasing transactions and the periodic increases in toll rates. Note also that the 2015 calendar estimate for revenue includes only the period of July through December, since the average daily transactions represent the condition for the six-month period after the toll road is opened.

The transactions data show that the truck percentage will be approximately 15 to 19 percent of total transactions over the duration of the forecast. This value represents the inclusion of higher truck percentage of transactions at the mainline plaza along with a lower percentage of trucks at the ramp plazas. Overall growth beyond the two-year ramp-up period is initially near 3 percent and then gradually transitions down towards 1.5% over the 40-year horizon period. The variation by year includes both the growth in the corridor as well as the impacts of new roads in the background network and the change in toll rates.

9.3 Fiscal Year Transaction and Revenue Estimates

Using the conversion process discussed in Section 9.1.6, the transactions and revenue from the calendar estimates were converted into fiscal year values. Table 9-9 lists the transactions by vehicle type and Table 9-10 lists the revenue by vehicle type by fiscal year. Note that the general trend of increases is similar to the model-based calendar year forecasts although the impacts of the periodic increases are blended across fiscal years because, for modeling purposes, the toll rate increases were assumed effective at the beginning of the calendar year.

Table 9-7
US 301 Mainline Annual Transactions by Vehicle Type

CALENDAR YEAR	AUTO			TRUCK			TOTAL				
	CASH	ETC	TOTAL	CASH	ETC	TOTAL	CASH	ETC	TOTAL	%ANNUAL GROWTH	%TRUCK
2015	6,206	10,285	16,491	1,378	1,627	3,005	7,584	11,912	19,496		15.4%
2016	6,467	11,526	17,993	1,461	1,854	3,315	7,928	13,380	21,308	9.3%	15.6%
2017	6,709	12,826	19,535	1,545	2,095	3,640	8,254	14,921	23,175	8.8%	15.7%
2018	6,617	13,531	20,148	1,548	2,238	3,786	8,165	15,769	23,934	3.3%	15.8%
2019	6,520	14,226	20,746	1,554	2,385	3,939	8,074	16,611	24,685	3.1%	16.0%
2020	6,424	14,929	21,353	1,561	2,527	4,088	7,985	17,456	25,441	3.1%	16.1%
2021	6,057	15,163	21,220	1,525	2,464	3,989	7,582	17,627	25,209	-0.9%	15.8%
2022	6,071	15,836	21,907	1,548	2,588	4,136	7,619	18,424	26,043	3.3%	15.9%
2023	6,088	16,519	22,607	1,567	2,716	4,283	7,655	19,235	26,890	3.3%	15.9%
2024	6,104	17,199	23,303	1,587	2,845	4,432	7,691	20,044	27,735	3.1%	16.0%
2025	6,121	17,877	23,998	1,608	2,973	4,581	7,729	20,850	28,579	3.0%	16.0%
2026	5,896	17,961	23,857	1,599	2,924	4,523	7,495	20,885	28,380	-0.7%	15.9%
2027	5,896	18,256	24,152	1,627	3,036	4,663	7,523	21,292	28,815	1.5%	16.2%
2028	5,905	18,555	24,460	1,653	3,154	4,807	7,558	21,709	29,267	1.6%	16.4%
2029	5,905	18,846	24,751	1,679	3,269	4,948	7,584	22,115	29,699	1.5%	16.7%
2030	5,908	19,137	25,045	1,707	3,383	5,090	7,615	22,520	30,135	1.5%	16.9%
2031	5,666	18,650	24,316	1,709	3,326	5,035	7,375	21,976	29,351	-2.6%	17.2%
2032	5,753	19,052	24,805	1,746	3,446	5,192	7,499	22,498	29,997	2.2%	17.3%
2033	5,841	19,451	25,292	1,782	3,566	5,348	7,623	23,017	30,640	2.1%	17.5%
2034	5,924	19,849	25,773	1,820	3,688	5,508	7,744	23,537	31,281	2.1%	17.6%
2035	6,006	20,250	26,256	1,856	3,812	5,668	7,862	24,062	31,924	2.1%	17.8%
2036	5,912	20,098	26,010	1,866	3,770	5,636	7,778	23,868	31,646	-0.9%	17.8%
2037	6,044	20,500	26,544	1,917	3,893	5,810	7,961	24,393	32,354	2.2%	18.0%
2038	6,170	20,894	27,064	1,968	4,022	5,990	8,138	24,916	33,054	2.2%	18.1%
2039	6,305	21,291	27,596	2,021	4,145	6,166	8,326	25,436	33,762	2.1%	18.3%
2040	6,431	21,684	28,115	2,071	4,271	6,342	8,502	25,955	34,457	2.1%	18.4%
2041	6,425	21,781	28,206	2,094	4,217	6,311	8,519	25,998	34,517	0.2%	18.3%
2042	6,515	22,125	28,640	2,123	4,318	6,441	8,638	26,442	35,080	1.6%	18.4%
2043	6,605	22,468	29,073	2,152	4,418	6,570	8,757	26,886	35,643	1.6%	18.4%
2044	6,695	22,812	29,507	2,181	4,519	6,700	8,876	27,330	36,206	1.6%	18.5%
2045	6,785	23,155	29,940	2,210	4,619	6,829	8,995	27,774	36,769	1.6%	18.6%
2046	6,762	23,250	30,012	2,215	4,574	6,790	8,977	27,825	36,802	0.1%	18.4%
2047	6,852	23,594	30,446	2,245	4,675	6,919	9,096	28,269	37,365	1.5%	18.5%
2048	6,942	23,937	30,879	2,274	4,775	7,049	9,215	28,713	37,928	1.5%	18.6%
2049	7,032	24,281	31,313	2,303	4,876	7,179	9,335	29,157	38,491	1.5%	18.7%
2050	7,122	24,624	31,746	2,332	4,976	7,308	9,454	29,601	39,055	1.5%	18.7%
2051	7,105	24,731	31,836	2,346	4,984	7,330	9,451	29,715	39,166	0.3%	18.7%
2052	7,195	25,074	32,269	2,375	5,084	7,460	9,570	30,159	39,729	1.4%	18.8%
2053	7,285	25,418	32,703	2,404	5,185	7,589	9,689	30,603	40,292	1.4%	18.8%
2054	7,375	25,761	33,136	2,433	5,285	7,719	9,808	31,047	40,855	1.4%	18.9%
2055	7,465	26,105	33,570	2,462	5,386	7,848	9,927	31,491	41,418	1.4%	18.9%
2056	7,453	26,220	33,673	2,469	5,346	7,815	9,922	31,566	41,488	0.2%	18.8%

Table 9-8
US 301 Mainline Annual Revenue by Calendar Year

CALENDAR YEAR	AUTO REVENUE ($1,000)			TRUCK REVENUE ($1,000)			TOTAL REVENUE ($1,000)			
	CASH	ETC	TOTAL	CASH	ETC	TOTAL	CASH	ETC	TOTAL	%ANNUAL GROWTH
2015[1]	$3,458	$3,732	$7,190	$2,396	$2,771	$5,167	$5,854	$6,503	$12,357	
2016	$7,269	$8,517	$15,786	$5,078	$6,311	$11,389	$12,347	$14,828	$27,175	119.9%
2017	$7,611	$9,627	$17,238	$5,369	$7,126	$12,495	$12,980	$16,753	$29,733	9.4%
2018	$7,573	$10,297	$17,869	$5,379	$7,608	$12,987	$12,952	$17,905	$30,857	3.8%
2019	$7,537	$10,963	$18,500	$5,399	$8,102	$13,501	$12,936	$19,065	$32,001	3.7%
2020	$7,498	$11,627	$19,125	$5,422	$8,582	$14,003	$12,919	$20,209	$33,128	3.5%
2021	$8,807	$14,157	$22,965	$6,710	$10,652	$17,361	$15,517	$24,809	$40,326	21.7%
2022	$8,852	$15,033	$23,885	$6,811	$11,183	$17,994	$15,663	$26,216	$41,879	3.9%
2023	$8,897	$15,919	$24,816	$6,895	$11,730	$18,624	$15,792	$27,649	$43,441	3.7%
2024	$8,941	$16,800	$25,741	$6,983	$12,281	$19,264	$15,924	$29,081	$45,006	3.6%
2025	$8,991	$17,686	$26,677	$7,076	$12,827	$19,903	$16,066	$30,513	$46,580	3.5%
2026	$10,391	$21,352	$31,743	$8,537	$15,233	$23,769	$18,928	$36,585	$55,512	19.2%
2027	$10,385	$21,716	$32,101	$8,683	$15,810	$24,494	$19,068	$37,526	$56,594	1.9%
2028	$10,391	$22,085	$32,476	$8,821	$16,419	$25,241	$19,212	$38,504	$57,716	2.0%
2029	$10,386	$22,448	$32,834	$8,959	$17,012	$25,971	$19,345	$39,460	$58,805	1.9%
2030	$10,385	$22,809	$33,194	$9,107	$17,601	$26,708	$19,493	$40,410	$59,902	1.9%
2031	$11,619	$25,696	$37,315	$10,280	$19,703	$29,983	$21,899	$45,399	$67,298	12.3%
2032	$11,815	$26,343	$38,158	$10,501	$20,410	$30,912	$22,316	$46,754	$69,069	2.6%
2033	$12,010	$26,980	$38,990	$10,718	$21,116	$31,834	$22,728	$48,096	$70,824	2.5%
2034	$12,200	$27,622	$39,822	$10,945	$21,833	$32,778	$23,145	$49,455	$72,600	2.5%
2035	$12,390	$28,264	$40,655	$11,161	$22,562	$33,724	$23,552	$50,827	$74,379	2.4%
2036	$13,993	$32,314	$46,307	$12,969	$25,691	$38,660	$26,962	$58,005	$84,967	14.2%
2037	$14,316	$33,042	$47,357	$13,324	$26,525	$39,849	$27,639	$59,567	$87,206	2.6%
2038	$14,631	$33,760	$48,391	$13,679	$27,400	$41,079	$28,310	$61,160	$89,470	2.6%
2039	$14,957	$34,486	$49,443	$14,047	$28,237	$42,284	$29,004	$62,723	$91,728	2.5%
2040	$15,277	$35,205	$50,482	$14,394	$29,093	$43,488	$29,672	$64,298	$93,970	2.4%
2041	$17,053	$38,846	$55,899	$16,515	$32,683	$49,199	$33,569	$71,529	$105,098	11.8%
2042	$17,292	$39,458	$56,751	$16,745	$33,462	$50,207	$34,037	$72,921	$106,958	1.8%
2043	$17,531	$40,071	$57,602	$16,974	$34,241	$51,215	$34,505	$74,312	$108,818	1.7%
2044	$17,770	$40,684	$58,454	$17,204	$35,020	$52,224	$34,974	$75,704	$110,678	1.7%
2045	$18,009	$41,296	$59,305	$17,433	$35,799	$53,232	$35,442	$77,095	$112,537	1.7%
2046	$19,822	$45,798	$65,619	$19,453	$39,469	$58,922	$39,275	$85,267	$124,542	10.7%
2047	$20,086	$46,474	$66,560	$19,708	$40,337	$60,045	$39,794	$86,811	$126,605	1.7%
2048	$20,349	$47,151	$67,500	$19,964	$41,204	$61,168	$40,313	$88,355	$128,668	1.6%
2049	$20,613	$47,827	$68,441	$20,219	$42,071	$62,290	$40,833	$89,898	$130,731	1.6%
2050	$20,877	$48,504	$69,381	$20,475	$42,938	$63,413	$41,352	$91,442	$132,794	1.6%
2051	$22,796	$53,317	$76,113	$21,959	$45,845	$67,804	$44,755	$99,162	$143,917	8.4%
2052	$23,085	$54,057	$77,142	$22,232	$46,769	$69,001	$45,316	$100,827	$146,143	1.5%
2053	$23,373	$54,798	$78,171	$22,504	$47,694	$70,198	$45,877	$102,492	$148,369	1.5%
2054	$23,662	$55,539	$79,201	$22,776	$48,618	$71,394	$46,438	$104,157	$150,595	1.5%
2055	$23,951	$56,279	$80,230	$23,049	$49,543	$72,591	$47,000	$105,822	$152,821	1.5%
2056	$25,983	$61,419	$87,402	$25,322	$53,875	$79,197	$51,305	$115,295	$166,599	9.0%

NOTE:

[1] - 2015 Revenue is only for half-year since the facility is assumed to be opened on July 1, 2015

Table 9-9
US 301 Mainline Daily Toll Transaction Forecast by Fiscal Year

FISCAL YEAR	AUTO			TRUCK			TOTAL				
	CASH	ETC	TOTAL	CASH	ETC	TOTAL	CASH	ETC	TOTAL	%ANNUAL GROWTH	%TRUCK
2016	6,173	10,592	16,765	1,381	1,692	3,073	7,554	12,284	19,838		15.5%
2017	6,425	11,829	18,254	1,469	1,926	3,395	7,894	13,755	21,649	9.1%	15.7%
2018	6,668	13,153	19,821	1,547	2,171	3,718	8,215	15,324	23,539	8.7%	15.8%
2019	6,573	13,855	20,428	1,553	2,317	3,870	8,126	16,172	24,298	3.2%	15.9%
2020	6,477	14,553	21,030	1,559	2,459	4,018	8,036	17,012	25,048	3.1%	16.0%
2021	6,260	15,040	21,300	1,540	2,493	4,033	7,800	17,533	25,333	1.1%	15.9%
2022	6,064	15,482	21,546	1,538	2,525	4,063	7,602	18,007	25,609	1.1%	15.9%
2023	6,080	16,150	22,230	1,559	2,656	4,215	7,639	18,806	26,445	3.3%	15.9%
2024	6,098	16,832	22,930	1,578	2,784	4,362	7,676	19,616	27,292	3.2%	16.0%
2025	6,116	17,520	23,636	1,598	2,912	4,510	7,714	20,432	28,146	3.1%	16.0%
2026	6,019	17,924	23,943	1,597	2,948	4,545	7,616	20,872	28,488	1.2%	16.0%
2027	5,895	18,102	23,997	1,615	2,980	4,595	7,510	21,082	28,592	0.4%	16.1%
2028	5,898	18,394	24,292	1,643	3,099	4,742	7,541	21,493	29,034	1.5%	16.3%
2029	5,905	18,686	24,591	1,668	3,216	4,884	7,573	21,902	29,475	1.5%	16.6%
2030	5,904	18,976	24,880	1,695	3,332	5,027	7,599	22,308	29,907	1.5%	16.8%
2031	5,790	18,905	24,695	1,702	3,352	5,054	7,492	22,257	29,749	-0.5%	17.0%
2032	5,709	18,843	24,552	1,730	3,386	5,116	7,439	22,229	29,668	-0.3%	17.2%
2033	5,789	19,230	25,019	1,766	3,511	5,277	7,555	22,741	30,296	2.1%	17.4%
2034	5,876	19,629	25,505	1,804	3,631	5,435	7,680	23,260	30,940	2.1%	17.6%
2035	5,959	20,030	25,989	1,840	3,754	5,594	7,799	23,784	31,583	2.1%	17.7%
2036	5,965	20,178	26,143	1,856	3,790	5,646	7,821	23,968	31,789	0.7%	17.8%
2037	5,975	20,291	26,266	1,891	3,831	5,722	7,866	24,122	31,988	0.6%	17.9%
2038	6,098	20,679	26,777	1,944	3,960	5,904	8,042	24,639	32,681	2.2%	18.1%
2039	6,229	21,073	27,302	1,997	4,086	6,083	8,226	25,159	33,385	2.2%	18.2%
2040	6,357	21,471	27,828	2,048	4,210	6,258	8,405	25,681	34,086	2.1%	18.4%
2041	6,431	21,733	28,164	2,078	4,246	6,324	8,509	25,979	34,488	1.2%	18.3%
2042	6,468	21,944	28,412	2,115	4,271	6,386	8,583	26,215	34,798	0.9%	18.4%
2043	6,558	22,287	28,845	2,157	4,378	6,535	8,715	26,665	35,380	1.7%	18.5%
2044	6,648	22,631	29,279	2,198	4,485	6,683	8,846	27,116	35,962	1.6%	18.6%
2045	6,738	22,974	29,712	2,240	4,592	6,832	8,978	27,566	36,544	1.6%	18.7%
2046	6,774	23,200	29,974	2,269	4,625	6,894	9,043	27,825	36,868	0.9%	18.7%
2047	6,804	23,413	30,217	2,298	4,660	6,958	9,102	28,073	37,175	0.8%	18.7%
2048	6,894	23,757	30,651	2,339	4,767	7,106	9,233	28,524	37,757	1.6%	18.8%
2049	6,984	24,100	31,084	2,381	4,873	7,254	9,365	28,973	38,338	1.5%	18.9%
2050	7,074	24,444	31,518	2,422	4,980	7,402	9,496	29,424	38,920	1.5%	19.0%
2051	7,114	24,675	31,789	2,456	5,040	7,496	9,570	29,715	39,285	0.9%	19.1%
2052	7,148	24,893	32,041	2,490	5,100	7,590	9,638	29,993	39,631	0.9%	19.2%
2053	7,238	25,237	32,475	2,531	5,207	7,738	9,769	30,444	40,213	1.5%	19.2%
2054	7,328	25,580	32,908	2,573	5,314	7,887	9,901	30,894	40,795	1.4%	19.3%
2055	7,418	25,924	33,342	2,614	5,421	8,035	10,032	31,345	41,377	1.4%	19.4%
2056	7,459	26,159	33,618	2,643	5,455	8,098	10,102	31,614	41,716	0.8%	19.4%

Table 9-10
US 301 Mainline Annual Toll Revenue Forecast by Fiscal Year

FISCAL YEAR	AUTO REVENUE ($1,000)			TRUCK REVENUE ($1,000)			TOTAL REVENUE ($1,000)			
	CASH	ETC	TOTAL	CASH	ETC	TOTAL	CASH	ETC	TOTAL	%ANNUAL GROWTH
2016	$6,904	$7,752	$14,656	$4,801	$5,761	$10,562	$11,705	$13,513	$25,218	
2017	$7,250	$8,812	$16,062	$5,103	$6,552	$11,655	$12,353	$15,364	$27,717	9.9%
2018	$7,593	$9,941	$17,534	$5,376	$7,381	$12,757	$12,969	$17,321	$30,291	9.3%
2019	$7,554	$10,608	$18,162	$5,395	$7,872	$13,268	$12,949	$18,481	$31,430	3.8%
2020	$7,518	$11,278	$18,796	$5,415	$8,351	$13,766	$12,933	$19,629	$32,561	3.6%
2021	$8,120	$12,826	$20,946	$6,067	$9,624	$15,691	$14,187	$22,450	$36,636	12.5%
2022	$8,827	$14,575	$23,402	$6,766	$10,914	$17,681	$15,593	$25,490	$41,083	12.1%
2023	$8,874	$15,448	$24,322	$6,859	$11,473	$18,332	$15,734	$26,920	$42,654	3.8%
2024	$8,919	$16,332	$25,252	$6,943	$12,020	$18,963	$15,862	$28,352	$44,215	3.7%
2025	$8,969	$17,223	$26,192	$7,032	$12,567	$19,598	$16,000	$29,790	$45,790	3.6%
2026	$9,655	$19,423	$29,078	$7,788	$14,047	$21,835	$17,443	$33,470	$50,914	11.2%
2027	$10,389	$21,525	$31,914	$8,619	$15,521	$24,140	$19,008	$37,046	$56,054	10.1%
2028	$10,387	$21,887	$32,274	$8,767	$16,134	$24,901	$19,155	$38,021	$57,175	2.0%
2029	$10,387	$22,248	$32,635	$8,900	$16,737	$25,637	$19,287	$38,985	$58,272	1.9%
2030	$10,384	$22,609	$32,993	$9,043	$17,335	$26,378	$19,427	$39,943	$59,371	1.9%
2031	$10,964	$24,176	$35,140	$9,672	$18,659	$28,332	$20,636	$42,835	$63,471	6.9%
2032	$11,715	$26,004	$37,720	$10,405	$20,057	$30,462	$22,120	$46,062	$68,182	7.4%
2033	$11,904	$26,638	$38,542	$10,621	$20,792	$31,413	$22,525	$47,430	$69,955	2.6%
2034	$12,097	$27,276	$39,373	$10,849	$21,498	$32,346	$22,946	$48,773	$71,720	2.5%
2035	$12,287	$27,922	$40,209	$11,065	$22,220	$33,284	$23,352	$50,141	$73,493	2.5%
2036	$13,150	$30,179	$43,329	$12,049	$24,146	$36,195	$25,199	$54,325	$79,524	8.2%
2037	$14,146	$32,664	$46,810	$13,142	$26,105	$39,247	$27,288	$58,769	$86,057	8.2%
2038	$14,459	$33,375	$47,834	$13,511	$26,978	$40,489	$27,971	$60,353	$88,323	2.6%
2039	$14,782	$34,097	$48,879	$13,880	$27,834	$41,714	$28,661	$61,931	$90,592	2.6%
2040	$15,102	$34,817	$49,919	$14,234	$28,677	$42,911	$29,336	$63,494	$92,830	2.5%
2041	$16,117	$36,933	$53,050	$15,442	$30,932	$46,374	$31,558	$67,866	$99,424	7.1%
2042	$17,166	$39,136	$56,302	$16,681	$33,104	$49,785	$33,848	$72,240	$106,087	6.7%
2043	$17,405	$39,748	$57,154	$17,009	$33,932	$50,941	$34,414	$73,681	$108,095	1.9%
2044	$17,644	$40,361	$58,005	$17,336	$34,761	$52,097	$34,980	$75,122	$110,102	1.9%
2045	$17,883	$40,974	$58,857	$17,663	$35,589	$53,253	$35,547	$76,563	$112,110	1.8%
2046	$18,867	$43,427	$62,294	$18,925	$37,896	$56,821	$37,792	$81,323	$119,114	6.2%
2047	$19,947	$46,118	$66,064	$20,176	$40,205	$60,382	$40,123	$86,323	$126,446	6.2%
2048	$20,211	$46,794	$67,005	$20,541	$41,127	$61,668	$40,752	$87,922	$128,673	1.8%
2049	$20,474	$47,471	$67,945	$20,905	$42,050	$62,955	$41,380	$89,521	$130,901	1.7%
2050	$20,738	$48,148	$68,886	$21,269	$42,972	$64,242	$42,008	$91,120	$133,127	1.7%
2051	$21,785	$50,782	$72,567	$22,290	$44,943	$67,233	$44,076	$95,725	$139,800	5.0%
2052	$22,932	$53,667	$76,600	$23,303	$46,913	$70,216	$46,236	$100,580	$146,816	5.0%
2053	$23,221	$54,408	$77,629	$23,692	$47,896	$71,588	$46,913	$102,304	$149,218	1.6%
2054	$23,510	$55,149	$78,658	$24,080	$48,880	$72,960	$47,590	$104,028	$151,618	1.6%
2055	$23,799	$55,889	$79,688	$24,469	$49,863	$74,332	$48,268	$105,752	$154,020	1.6%
2056	$24,912	$58,712	$83,625	$25,948	$52,606	$78,554	$50,861	$111,318	$162,179	5.3%

9.4 Impact on I-95/Delaware Turnpike Traffic and Revenue

As mentioned previously, the US 301 routing (via the Chesapeake Bay Bridge) is an alternative to I-95 (via Baltimore) for trips between Wilmington and points north and Washington D.C. and points south. The US 301 Mainline Toll Road will improve the US 301 routing, but there is a tradeoff between this network improvement and the added toll associated with the new toll road. While the exact time savings for the individual trip origins west of the Chesapeake Bay will vary depending on their proximity to the I-95-based routing and the US 50/US 301 routing, the improved travel times from the US 301 Mainline Toll Road should result in some diversion to the new toll road. Using information from the 2011 origin-destination survey and the distribution patterns from the Baltimore Metropolitan Council's regional model, Stantec has made assumptions of the number of trips that would divert to US 301 Toll Road. These trips are assumed to enter the toll road at the mainline plaza and travel the entire length of the toll road to access SR 1 and continue to destinations beyond Middletown.

In response to the anticipated diversion, the impact on I-95/Delaware Turnpike revenue for the first 26 years following the opening of the US 301 Mainline Toll Road was estimated. Note that since the toll plans for the Delaware Turnpike's I-95 plaza are nearly identical to the toll rates for the US 301 Mainline Toll Road, any revenues diverted from the Turnpike system will be offset by revenues gained on the new toll road.

As shown in Table 9-11, during the first full year of operation, approximately 2.1 percent of the transactions on the new toll road and approximately 2.8 percent of the revenue on the US 301 Mainline Toll Road will be the result of diversions from I-95. By the end of the model-based forecast period (2041), traffic being diverted from I-95 represents 1.9 percent of transactions and 2.4 percent of total revenue on the US 301 Mainline Toll Road. Note also that the loss of revenue on the Delaware Turnpike is relatively minor given that currently there are more than 71,000 daily transactions at the Newark Toll Plaza.

Table 9-11
Impact on I-95/Delaware Turnpike Revenue

Calendar Year	Average Daily Transactions			Revenue Forecast ($1,000)		
	Gross US 301	Impact From I-95	Net US 301	Gross US 301	Impact From I-95	Net US 301
2015	19,496	-406	19,090	$12,357	($351)	$12,006
2016	21,308	-439	20,869	$27,175	($762)	$26,413
2017	23,175	-463	22,712	$29,733	($798)	$28,935
2018	23,934	-467	23,467	$30,857	($800)	$30,057
2019	24,685	-475	24,210	$32,001	($813)	$31,188
2020	25,441	-484	24,957	$33,128	($832)	$32,296
2021	25,209	-487	24,722	$40,326	($1,050)	$39,276
2022	26,043	-490	25,553	$41,879	($1,052)	$40,826
2023	26,890	-501	26,389	$43,441	($1,074)	$42,366
2024	27,735	-510	27,225	$45,006	($1,101)	$43,905
2025	28,579	-519	28,060	$46,580	($1,117)	$45,463
2026	28,380	-524	27,856	$55,512	($1,365)	$54,147
2027	28,815	-527	28,288	$56,594	($1,365)	$55,229
2028	29,267	-545	28,722	$57,716	($1,420)	$56,296
2029	29,699	-547	29,152	$58,805	($1,411)	$57,394
2030	30,135	-559	29,576	$59,902	($1,453)	$58,450
2031	29,351	-567	28,784	$67,298	($1,700)	$65,598
2032	29,997	-571	29,426	$69,069	($1,710)	$67,359
2033	30,640	-578	30,062	$70,824	($1,728)	$69,097
2034	31,281	-588	30,693	$72,600	($1,760)	$70,840
2035	31,924	-600	31,324	$74,379	($1,800)	$72,578
2036	31,646	-614	31,032	$84,967	($2,117)	$82,850
2037	32,354	-614	31,740	$87,206	($2,100)	$85,106
2038	33,054	-625	32,429	$89,470	($2,148)	$87,322
2039	33,762	-634	33,128	$91,728	($2,178)	$89,550
2040	34,457	-642	33,815	$93,970	($2,209)	$91,761
2041	34,517	-655	33,862	$105,098	($2,542)	$102,556

9.5 Revenue Forecast Assumptions

The development of the revenue forecasts for the US 301 Mainline Toll Road Traffic and Revenue Report required a series of assumptions pertaining to future conditions. These assumptions include, but are not limited to, the following list of conditions:

1. The toll collection plans and rates as adopted for the US Mainline Toll Road and the other toll roads in the region will be implemented as proposed. This includes two near-term increases in the toll rates for MdTA facilities along the I-95 corridor.

2. Transponder market shares assumed for US 301 Mainline Toll Road occur as forecast in Sections 9.1.5 of the report.

3. The traffic mix for trucks will remain approximately as forecasted such that the average truck toll multiplier (for revenue-estimation purposes) will be approximately 2.46 for the duration of the forecast period. Note that the truck definition used in the calculation includes 2-axle 6-tire trucks.

4. The socioeconomic growth discussed in Chapter 5 of the report will occur as forecast.

5. The highway network improvements and truck restrictions discussed in Chapter 7 of the report will be constructed and enforced as planned.

6. Inflation will continue at 2.4 percent annually (compounded) during the forecast period through 2056. The 2.4 rate reflects the historical increase in CPI from 2000 to 2010.

7. The traffic on the US 301 Mainline Toll Road will complete the assumed early year *ramp-up* period as formulated in Sections 9.1.3 of the report.

8. The US 301 Mainline Toll Road will be efficiently maintained and operated, but even under the most efficient operation, there will be some toll evasion and revenue "leakage" that have been deducted from the model-produced traffic and revenue forecasts (after ramp-up) — discussed in Sections 9.1.4 of the report.

9. Motor fuel will remain in adequate supply during the forecast period, and motor fuel prices (i.e., the average price for regular gasoline) in the foreseeable future will not increase above the 1980 peak, which, if adjusted for inflation, in current dollars would not be more than $3.50 per gallon for an extended period.

10. Federal and state fuel tax increases will not increase to the extent that, together with fuel price increases, pump prices exceed $3.50 per gallon, adjusted for inflation going forward.

11. No radical change in travel modes, which would drastically curtail motor vehicle use, is expected during the forecast period.

9.6 Disclaimers and Limitations

It is Stantec's opinion that the revenue projections are reasonable and that they have been prepared in accordance with accepted practice for investment-grade studies. However, given the uncertainties within the current international and economic climate, Stantec considers it is necessary to state that the traffic and revenue projections are based on the following caveats:

1. This report presents the results of Stantec's consideration of the information available to us as of the date hereof and the application of Stantec's experience and professional judgment to that information. It is not a guarantee of any future events or trends.

2. The traffic and revenue forecasts will be subject to future economic and social conditions and demographic developments that cannot be predicted with certainty.

3. The projections contained in this report, while presented with numerical specificity, are based on a number of estimates and assumptions which, though considered reasonable to us, are inherently subject to significant economic and competitive uncertainties and contingencies, many of which will be beyond Stantec's control and that of DelDOT. In many instances, a broad range of alternative assumptions could be considered reasonable. Changes in the assumptions used could result in material differences in projected outcomes.

4. If, for any reason, any of these conditions should change due to changes in the economy or competitive environment, or other factors, Stantec's opinions or estimates may require amendment or further adjustments.

5. Stantec's toll revenue projections only represent its best judgment and Stantec does not warrant or represent that actual toll revenues will not vary from its projections, estimates and forecasts.

6. Many statements contained in this report that are not historical facts are forward-looking statements, which are based on Stantec's beliefs, as well as assumptions made by, and information currently available to, the management and staff of Stantec. Because the statements are based on expectations about future events and economic performance and are not statements of fact, actual results may differ materially from those projected. The words "anticipate", "assume", "estimate", "expect", "objective", "projection", "plan", "forecast", "goal", "budget", or similar words are intended to identify forward-looking statements. The words or phrases "to date", "now", "currently", and the like are intended to mean as of the date of this official statement.

As for the projections themselves, while they are stated year-by-year, they are intended to show the trends that may reasonably be anticipated on the basis of the above assumptions. The report contains forward-looking statements, revenue projections, and statements of opinion based upon certain information. These forward-looking and opinions statements and projections include statements relating to preexisting conditions not caused or created by Stantec and external conditions beyond our control. We believe that our expectations are reasonable and are based on reasonable assumptions. However, such forward-looking statements, projections and opinions, by their nature involve risks and uncertainties beyond our control. We caution that a variety of factors could cause the actual revenue associated with the US 301 Mainline project to differ from that expressed or implied in this document. We assume no obligation with respect to the differences between this document and the actual performance of the US 301 Mainline. This document was prepared solely for the use of DelDOT that commissioned it and in our role as a subconsultant to RK&K. It may only be relied upon by third parties at their own risk. Under no circumstance will Stantec be liable to third parties for claims or damage arising out of this document unless expressly agreed between the third party and Stantec. Any unauthorized use of this document is at the user's sole risk.

10 SENSITIVITY ANALYSIS

Stantec performed a series of sensitivity analysis trials to quantify the impact to transactions and revenue in response to changes in the baseline forecast assumptions. The results of these trials are listed in Table 10-1. In the first test, the suspension of the second scheduled toll increase planned by MdTA in FY 2014 would result in a minimal increase in transactions and revenue for the US 301 Mainline Toll Road. Similarly if no diversion of current traffic on I-95 is assumed, there would be a loss of 2.1% of transactions and 2.8% of revenue. It is anticipated that these sensitivity trials will be useful as a starting point for the analysis performed by the rating agencies and other potential sensitivity tests that might be requested as part of their evaluation.

10.1 Overview of Analyses

Several trials were conducted to examine the sensitivity of the 2015 opening year transactions and revenue from changes in the baseline forecast assumptions. These assumptions included changes to the planned toll increases on MdTA's toll facilities and also a scenario where diversion from existing I-95 travelers was assumed to not to occur. The results of these trials are listed in Table 10-1.

In the first test, the suspension of the second scheduled toll increase planned by MdTA in FY 2014 would result in a minimal increase in transactions and revenue for the US 301 Mainline Toll Road. This increase is due to the fact the Bay Bridge Toll increase scheduled for FY 2014 is large in comparison to the change in the JFK Toll Plaza for that same year. Removing that scheduled toll increase causes a minor increase in trips using US 301 routing. In contrast, if no diversion of current traffic on I-95 is assumed, there would be a loss of 2.1% of transactions and 2.8% of revenue.

Table 10-1
Transaction and Revenue Impacts for Sensitivity Scenarios

TOLL ROAD SCENARIO	DESCRIPTION	%LOSS COMPARED TO BASE SCENARIO	
		TRANSACTIONS	REVENUE ($1,000)
No Toll Increase in 2014	US 301 Mainline Build, and only 2012 Maryland's Toll Increase in-place, and with I-95 Diversion	0.1%	0.1%
No I-95 Diversion	US 301 Mainline Build and No I-95 Diversion	-2.1%	-2.8%

APPENDIX A

ASSESSMENT OF DELAWARE DOT'S SOCIOECONOMIC FORECASTS IN THE US 301 STUDY AREA – OCTOBER 2011

A.1 Socioeconomic Data Review Methodology

The purpose of this technical memorandum is to identify current demographic and economic trends in the Middletown, Delaware region and to incorporate these trends into a review and adjustment of socioeconomic forecasts from the Delaware Department of Transportation's (DelDOT) 2010 Peninsula transportation model for the U.S. Highway 301 (US 301) project study area. The US 301 study area consists of all portions of New Castle County, Delaware south of the Chesapeake and Delaware Canal. The US 301 study area also includes portions of southwestern Cecil County and northwestern Kent County, both of which are located in the state of Maryland. For descriptive purposes, this memorandum divides the overall project study area into multiple areas and assesses development trends of each one, in terms of location and scale of growth. The memorandum also compares the revised county control total figures for the overall DelDOT Peninsula transportation model study area to the original county control totals from the DelDOT Peninsula model and provides a brief description of the methodology used to adjust the socioeconomic data at the Traffic Serial Zone (TSZ) level.

A.2 Recent Regional Population and Employment Trends

A.2.1 Population

The population within the 12-county DelDOT Peninsula transportation model was 1.3 million residents according to the 2010 U.S. Census, which was an increase of more than 167,000 residents since the 2000 U.S. Census (See Table 1). During this period, the overall growth rate of the 12-county region was 14.22 percent, which was a compounded annual growth rate (CAGR) of 1.34 percent. New Castle County, which contains the city of Wilmington, Delaware and much of the project study area, was the largest county with a 2010 population of 538,479 residents. The two other counties in the project study area, Cecil County, Maryland and Kent County, Maryland, had 2010 populations of 101,108 and 20,197 residents, respectively. In terms of percentage growth, population growth in New Castle County between the 2000 and 2010 U.S. Censuses was a modest 7.64 percent or a CAGR of 0.74 percent. Population growth in Cecil County was higher at 17.63 percent (1.64 percent CAGR); while population growth in Kent County, MD was lower at 5.19 percent (0.51 percent CAGR).

Table A-1
Delaware Regional Model 2000 and 2010 U.S. Census Counts

	2000 Census	2010 Census	Total Difference	Percent Change	CAGR
Caroline County, MD	29,772	33,066	3,294	11.06%	1.05%
Cecil County, MD	85,951	101,108	15,157	17.63%	1.64%
Dorchester County, MD	30,675	32,618	1,943	6.33%	0.62%
Kent County, DE	126,704	162,310	35,606	28.10%	2.51%
Kent County, MD	19,200	20,197	997	5.19%	0.51%
New Castle County, DE	500,272	538,479	38,207	7.64%	0.74%
Queen Anne's County, MD	40,560	47,798	7,238	17.85%	1.66%
Somerset County, MD	24,747	26,470	1,723	6.96%	0.68%
Sussex County, DE	156,581	197,145	40,564	25.91%	2.33%
Talbot County, MD	33,812	37,782	3,970	11.74%	1.12%
Wicomico County, MD	84,644	98,733	14,089	16.65%	1.55%
Worchester County, MD	46,543	51,454	4,911	10.55%	1.01%
Total	**1,179,461**	**1,347,160**	**167,699**	**14.22%**	**1.34%**

Source: U.S. Census Bureau, 2011.

A.2.2 Agency Population Projections

Recent population projections for Delaware were produced by the Delaware Population Consortium for five-year intervals between 2010 and 2040. The Delaware Population Consortium consists of members from municipalities, county governments, metropolitan planning organizations, state government, and academic institutions. The Consortium produces and shares an annual set of population projections for the State of Delaware, its counties, and major municipalities. The projections are produced using the cohort-component method with future migration rates based upon anticipated future employment levels. The Consortium's 2010 population projections were released during October 2010 and are provided below in Table 2. These projections show relatively slow and diminishing growth rates for New Castle County through 2040. New Castle County's projected 2040 population is 606,881 residents or an increase of more than 68,000 residents since the 2010 U.S. Census or a CAGR of 0.40

Table A-2
2010 Delaware Population Consortium Population Projections

POPULATION PROJECTIONS			
	Kent	New Castle	Sussex
2010	162,310	538,479	197,145
2015	169,884	554,405	216,160
2020	178,817	567,764	235,341
2025	186,202	578,739	254,556
2030	192,853	589,267	272,511
2035	199,065	598,817	290,363
2040	204,952	606,881	308,690
TOTAL POPULATION CHANGE			
	Kent	New Castle	Sussex
2010-2015	7,574	15,926	19,015
2015-2020	8,933	13,359	19,181
2020-2025	7,385	10,975	19,215
2025-2030	6,651	10,528	17,955
2030-2035	6,212	9,550	17,852
2035-2040	5,887	8,064	18,327
2010-2040	**42,642**	**68,402**	**111,545**
COMPOUNDED ANNUAL GROWTH RATE			
	Kent	New Castle	Sussex
2010-2015	0.87%	0.56%	1.77%
2015-2020	1.03%	0.48%	1.71%
2020-2025	0.81%	0.38%	1.58%
2025-2030	0.70%	0.36%	1.37%
2030-2035	0.64%	0.32%	1.28%
2035-2040	0.58%	0.27%	1.23%
2010-2040	**0.77%**	**0.40%**	**1.49%**

Note: The 2010 population data are from the U.S. Census Bureau's count for April 1, 2010. The population projections for total population are for July 1st of each year.

Sources: U.S. Census Bureau, 2011 and Delaware Population Consortium, 2011.

percent during this period. The Consortium projected relatively strong population growth for Sussex County, which is expected to grow by approximately 111,000 new residents. More modest growth was projected for Kent County. The Consortium's projected 2040 population for Kent County is 204,952 residents, which is an increase of almost 42,600 residents from the 2010 U.S. Census.

Population projections for Maryland counties were produced by the Maryland State Data Center, which is part of the Maryland Department of Planning. The agency's population projections are provided below in Table 3 and were updated during December 2010. Although the agency's website does not specifically describe how the forecasts were prepared or list migration rate assumptions, it is reasonable to assume that the cohort component method was used.

Among the nine counties in Maryland that are in the 12-county DelDOT model, Cecil County's population is expected to grow the most. Between 2000 and 2040, the Cecil County is expected to add almost 65,000 residents at a CAGR of 1.65 percent. Kent County's population growth, on the other hand, is expected to be significantly more constrained with approximately 4,100 new residents being added during this period or a CAGR of 0.61 percent.

Table A-3
2010 Maryland State Data Center Population Projections

POPULATION PROJECTIONS

	Caroline	Cecil	Dorchester	Kent	Queen Anne's	Somerset	Talbot	Wicomico	Worchester
2010	33,066	101,108	32,618	20,197	47,798	26,470	37,782	98,733	51,454
2015	35,900	113,800	34,050	21,300	51,950	27,050	38,300	100,800	52,650
2020	38,300	125,100	35,700	22,200	55,650	27,800	39,800	106,450	55,300
2025	40,800	136,100	37,050	22,900	58,900	28,450	41,000	111,650	57,350
2030	43,300	146,800	38,250	23,400	61,900	28,850	41,850	116,450	58,950
2035	45,700	156,300	39,300	23,850	64,700	29,200	42,500	120,900	60,350
2040	48,100	165,800	40,200	24,300	67,300	29,500	42,950	124,900	61,500

TOTAL POPULATION CHANGE

	Caroline	Cecil	Dorchester	Kent	Queen Anne's	Somerset	Talbot	Wicomico	Worchester
2010-2015	2,834	12,692	1,432	1,103	4,152	580	518	2,067	1,196
2015-2020	2,400	11,300	1,650	900	3,700	750	1,500	5,650	2,650
2020-2025	2,500	11,000	1,350	700	3,250	650	1,200	5,200	2,050
2025-2030	2,500	10,700	1,200	500	3,000	400	850	4,800	1,600
2030- 2035	2,400	9,500	1,050	450	2,800	350	650	4,450	1,400
2035- 2040	2,400	9,500	900	450	2,600	300	450	4,000	1,150
2010-2040	**15,034**	**64,692**	**7,582**	**4,103**	**19,502**	**3,030**	**5,168**	**26,167**	**10,046**

COMPOUNDED ANNUAL GROWTH RATE

	Caroline	Cecil	Dorchester	Kent	Queen Anne's	Somerset	Talbot	Wicomico	Worchester
2010-2015	1.58%	2.28%	0.82%	1.02%	1.60%	0.41%	0.26%	0.40%	0.44%
2015-2020	1.30%	1.91%	0.95%	0.83%	1.39%	0.55%	0.77%	1.10%	0.99%
2020-2025	1.27%	1.70%	0.75%	0.62%	1.14%	0.46%	0.60%	0.96%	0.73%
2025-2030	1.20%	1.53%	0.64%	0.43%	1.00%	0.28%	0.41%	0.85%	0.55%
2030- 2035	1.08%	1.26%	0.54%	0.38%	0.89%	0.24%	0.31%	0.75%	0.47%
2035- 2040	1.03%	1.19%	0.45%	0.37%	0.79%	0.20%	0.21%	0.65%	0.38%
2010-2040	**1.25%**	**1.65%**	**0.69%**	**0.61%**	**1.14%**	**0.36%**	**0.42%**	**0.78%**	**0.59%**

Note: The 2010 population data are from the U.S. Census Bureau's count for April 1, 2010. The population projections for total population are for July 1st of each year.

Source: U.S. Census Bureau, 2011 and Maryland State Data Center, 2011.

A.3 Recent Employment Trends

Table 4 provides total employment estimates from the U.S. Bureau of Labor Statistics' Quarterly Census of Employment and Wages (QCEW) for counties in the DelDOT Peninsula transportation model for 2001 and 2010. The data show that the region essentially had no net growth, in terms of employment over the nine year period. Moderate gains in some counties were offset by large losses in others with a few counties breaking even. Total employment for the 12-county region, between 2001 and 2010, fell by 571 jobs or an overall change of -0.10 percent. The overall CAGR for employment, during the period between 2001 and 2010, was -0.01 percent.

Table A-4
2001 and 2010 Delaware Regional Model Employment Estimates

County	2001	2010	Total Difference	Percent Change	CAGR
Caroline County, MD	8,596	8,539	-57	-0.66%	-0.07%
Cecil County, MD	25,573	27,822	2,249	8.79%	0.94%
Dorchester County, MD	11,295	11,288	-7	-0.06%	-0.01%
Kent County, DE	50,760	60,027	9,267	18.26%	1.88%
Kent County, MD	7,914	7,659	-255	-3.22%	-0.36%
New Castle County, DE	282,318	261,981	-20,337	-7.20%	-0.83%
Queen Anne's County, MD	11,167	13,193	2,026	18.14%	1.87%
Somerset County, MD	6,965	6,688	-277	-3.98%	-0.45%
Sussex County, DE	61,813	69,131	7,318	11.84%	1.25%
Talbot County, MD	18,642	17,712	-930	-4.99%	-0.57%
Wicomico County, MD	41,753	43,656	1,903	4.56%	0.50%
Worchester County, MD	24,423	22,952	-1,471	-6.02%	-0.69%
Total	**551,219**	**550,648**	**-571**	**-0.10%**	-0.01%

Source: U.S. Bureau of Labor Statistics, 2011.

Recent employment data from the U.S. Bureau of Labor Statistics' Quarterly Census of Employment and Wages (QCEW) show that the employment levels in Kent County, Delaware and Sussex County have grown significantly between 2001 and 2010 (See Table 5). During this period, Kent County's total employment increased by 9,267 jobs and Sussex County's employment increased by 7,318 jobs. In both counties, year-over-year employment increased during most years between 2001 and 2010, with exceptions between the years of 2007 and 2010 in Kent County and between 2006 and 2009 in Sussex County. Overall, the CAGR for employment growth in Kent and Sussex Counties between 2001 and 2010 was 1.88 percent and 1.25 percent, respectively.

Total employment in New Castle County actually fell by 20,337 jobs between 2001 and 2010, largely affected by losses between 2008 and 2009, when total employment dropped by more

than 20,000 jobs. Modest gains in some years were offset by losses in others, resulting in an overall CAGR of -0.83% for the 2001 to 2010 period.

Table A-5
Delaware County Employment Estimates (2001-2010)

EMPLOYMENT TOTALS

	Kent	New Castle	Sussex
2001	50,760	282,318	61,813
2002	52,444	275,491	63,109
2003	56,191	277,069	63,816
2004	58,845	280,482	66,933
2005	61,267	281,675	69,916
2006	62,146	282,884	71,440
2007	63,154	283,231	70,766
2008	62,659	281,652	70,625
2009	60,221	266,258	68,572
2010	60,027	261,981	69,131

TOTAL EMPLOYMENT CHANGE

	Kent	New Castle	Sussex
2001-2002	1,684	-6,827	1,296
2002-2003	3,747	1,578	707
2003-2004	2,654	3,413	3,117
2004-2005	2,422	1,193	2,983
2005-2006	879	1,209	1,524
2006-2007	1,008	347	-674
2007-2008	-495	-1,579	-141
2008-2009	-2,438	-15,394	-2,053
2009-2010	-194	-4,277	559
2001-2010	**9,267**	**-20,337**	**7,318**

ANNUAL GROWTH RATE

	Kent	New Castle	Sussex
2001-2002	3.32%	-2.42%	2.10%
2002-2003	7.14%	0.57%	1.12%
2003-2004	4.72%	1.23%	4.88%
2004-2005	4.12%	0.43%	4.46%
2005-2006	1.43%	0.43%	2.18%
2006-2007	1.62%	0.12%	-0.94%
2007-2008	-0.78%	-0.56%	-0.20%
2008-2009	-3.89%	-5.47%	-2.91%
2009-2010	-0.32%	-1.61%	0.82%
2001-2010†	**1.88%**	**-0.83%**	**1.25%**

† Compounded annual growth rate.

Source: U.S. Bureau of Labor Statistics, 2011.

Among the Maryland counties within DelDOT's Peninsula transportation model, Cecil, Wicomico, and Queen Anne's Counties experienced the most vigorous employment growth between 2001 and 2010. Table 6 shows that Cecil County's employment grew the most, adding 2,249 jobs (CAGR 0.94 percent); followed by Queen Anne's County with 2,026 jobs (CAGR 1.87 percent) and Wicomico County with 1,903 new jobs (CAGR 0.50 percent).

In the remaining Maryland counties, overall employment change during the 2001 to 2010 period was negative. Caroline and Dorchester Counties experienced very minor job losses, while the other counties had more significant losses. Employment losses between 2007 and 2009 generally erased any employment gains made earlier. Some counties also experienced losses between 2001 and 2003, as well as during other years.

Table A-6
Maryland County Employment Estimates (2001-2010)

TOTAL EMPLOYMENT

	Caroline	Cecil	Dorchester	Kent	Queen Anne's	Somerset	Talbot	Wicomico	Worchester
2001	8,596	25,573	11,295	7,914	11,167	6,965	18,642	41,753	24,423
2002	8,580	26,830	11,251	8,022	11,791	6,830	18,924	41,486	25,549
2003	8,502	27,091	11,456	7,731	12,482	6,973	19,030	41,867	25,057
2004	8,646	28,283	12,128	8,025	12,799	6,940	18,893	43,706	24,378
2005	8,727	29,193	12,028	8,082	12,918	6,969	19,148	45,351	24,504
2006	8,676	30,012	11,772	8,384	13,575	7,211	19,295	46,944	24,998
2007	8,932	30,763	11,760	8,600	14,308	7,112	19,444	46,902	24,533
2008	8,872	30,733	11,431	8,251	14,114	7,065	19,568	46,447	24,107
2009	8,568	30,204	11,188	7,908	13,379	6,855	18,191	44,621	23,211
2010	8,539	27,822	11,288	7,659	13,193	6,688	17,712	43,656	22,952

TOTAL EMPLOYMENT CHANGE

	Caroline	Cecil	Dorchester	Kent	Queen Anne's	Somerset	Talbot	Wicomico	Worchester
2001-2002	-16	1,257	-44	108	624	-135	282	-267	1,126
2002-2003	-78	261	205	-291	691	143	106	381	-492
2003-2004	144	1,192	672	294	317	-33	-137	1,839	-679
2004-2005	81	910	-100	57	119	29	255	1,645	126
2005-2006	-51	819	-256	302	657	242	147	1,593	494
2006-2007	256	751	-12	216	733	-99	149	-42	-465
2007-2008	-60	-30	-329	-349	-194	-47	124	-455	-426
2008-2009	-304	-529	-243	-343	-735	-210	-1,377	-1,826	-896
2009-2010	-29	-2,382	100	-249	-186	-167	-479	-965	-259
2001-2010	**-57**	**2,249**	**-7**	**-255**	**2,026**	**-277**	**-930**	**1,903**	**-1,471**

Table A-6 (Continued)
Maryland County Employment Estimates (2001-2010)

	ANNUAL GROWTH RATE								
	Caroline	Cecil	Dorchester	Kent	Queen Anne's	Somerset	Talbot	Wicomico	Worchester
2001-2002	-0.19%	4.92%	-0.39%	1.36%	5.59%	-1.94%	1.51%	-0.64%	4.61%
2002-2003	-0.91%	0.97%	1.82%	-3.63%	5.86%	2.09%	0.56%	0.92%	-1.93%
2003-2004	1.69%	4.40%	5.87%	3.80%	2.54%	-0.47%	-0.72%	4.39%	-2.71%
2004-2005	0.94%	3.22%	-0.82%	0.71%	0.93%	0.42%	1.35%	3.76%	0.52%
2005-2006	-0.58%	2.81%	-2.13%	3.74%	5.09%	3.47%	0.77%	3.51%	2.02%
2006-2007	2.95%	2.50%	-0.10%	2.58%	5.40%	-1.37%	0.77%	-0.09%	-1.86%
2007-2008	-0.67%	-0.10%	-2.80%	-4.06%	-1.36%	-0.66%	0.64%	-0.97%	-1.74%
2008-2009	-3.43%	-1.72%	-2.13%	-4.16%	-5.21%	-2.97%	-7.04%	-3.93%	-3.72%
2009-2010	-0.34%	-7.89%	0.89%	-3.15%	-1.39%	-2.44%	-2.63%	-2.16%	-1.12%
2001-2010[†]	**-0.07%**	**0.94%**	**-0.01%**	**-0.36%**	**1.87%**	**-0.45%**	**-0.57%**	**0.50%**	**-0.69%**

[†] Compounded annual growth rate.

Source: U.S. Bureau of Labor Statistics, 2011.

A.4 Growth Patterns within the US 301 Study

The US 301 study area experienced significant residential and commercial development between 2000 and 2008 and, as residential growth has occurred, so has economic activity. Starting in 2008, there has been a substantial slowing of new residential and commercial construction, but it has not come to a complete halt. The sections below will detail recent, ongoing, and anticipated residential and commercial development projects within the US 301 study area.

A.4.1 Recent Residential Development

Table 7 identifies the names of active subdivisions—approved and under construction— within the US 301 study area. The table also lists the number of lots platted in each subdivision, and the number of units completed during late 2010. At that time, there were 16 subdivisions under construction, which contained approximately 4,600 available lots.

Table A-7
US 301 Study Area ActiveSubdivision Projects

TSZ	Subdivision Name	Number of Lots	Units Completed
279/280	Bayberry North	949	0
302/303	Odessa National	761	255
197	Willow Grove Mill	~700	478
190	Spring Arbor	521	104
191	Parkside	492	161
292/293	Estates at St. Anne	466	165
190	Parkway at South Ridge	446	24
194	Canalview at Crossland	432	27
192	Shannon Cove	410	67
300	Townsend Village II	336	149
289	Townsend Village	242	83
303	Enclave at Odessa	205	66
275/278	Augustine Creek Phase I & II	177	118
190	Merrimack Commons	78	0
302	Fairways at Odessa National	70	14
279	Ashbury Chase II	40	23
	TOTAL	**~6,325**	**1,734**

Source: New Castle County, Delaware, 2010.

No recent residential construction was identified or observed in Cecil or Kent Counties, Maryland.

A.4.2 Future Residential Growth

The recession that began during 2008 substantially slowed the development of existing residential subdivisions within the US 301 project study area and delayed planned projects. Even as the national economy has started to improve and the regional economy is approaching stabilization, it is still not possible to predict precisely when the regional housing market will recover. The market will most likely be depressed for an additional one to three years. Regardless of the nation's economic problems, there will likely still be new housing construction in the project study area to meet the needs of a growing population. However, household formation and construction volume will be much slower than in the mid-2000s. These factors were considered when assessing and adjusting the population forecasts. As the housing market contracts and eventually recovers, local planners anticipate that slightly more than half of the new population growth in New Castle County will occur within the US 301 study area. In addition to the remaining lots in existing subdivisions under construction (during December 2010), there are almost 12,000 lots or multifamily units in 29 subdivisions that have undergoing the platting and subdivision approval process or have been placed on hold due to market conditions.

The locations of these proposed subdivisions by TSZ and the number of proposed lots in each one are shown in Table 8. Most of these subdivisions fall within New Castle County's preferred development corridor between the current US 301 and Route 1. However, there are other approved subdivisions that are outside of this corridor and New Castle County government will allow certain ones to proceed. Any future subdivisions seeking approval will need to locate within the preferred growth corridor or would need to supply their own water and wastewater utilities in order to be considered for approval.

Table A-8
US 301 Study Area Proposed Residential Subdivision Projects

TSZ	Subdivision Name	Proposed Number of Lots
291	Westown (Levels)	1,800
309	Deat's Farm	1,381
210	The Highlands	1,250
274	Village of Bayberry South	1,186
193	Carter Farm	578
279	Winchelsea	513
216	Pleasanton	434
277	Country Club Estates	407
321	High Hook Farms	390
267	Poole Property	385
302/303	Robinson Farms	333
303	Smith Farm	328
274	Boyd's Corner Farm	287
312	Churchtown Manor	273
266	Promenade at Middletown	273
336	Spring Oaks	242
272	Tides at Silver Run	241
294/296	Odessa Commons	240
199/306	Roberts Farm	208
272	Ponds at Odessa	207
271	Silver Maple Farm	187
321	Baymont Farms	157
310	Rothwell Village	150
280	Hyett's Corner	143
216	Cedar Lane	81
275	Ashby's Place	54
213	The Highlands at Back Creek	50
193	Biggs Farm	20
213	Estates at Ridgefield	16
	TOTAL	**11,814**

Source: New Castle County, Delaware, 2010.

In stark contrast, relatively little new residential growth has occurred in the portion of the US 301 study area that lies within Cecil County or Kent County, MD and little new growth is expected. Within Cecil County, large areas of land have been set aside, through the purchase of easements, for agricultural or ecological preservation. As a result, current land uses are very unlikely to change over the forecast horizon. In areas that do permit new residential development, future growth has been restricted to very low densities (e.g. one residential unit per 20 acres). In areas without these restrictions, four subdivisions are proposed in TSZ 1691, ranging in size from 8 to 47 lots. County planners also identified an area of land south of Chesapeake City that might be developed in the future. While future residential development in Kent County, MD is less hindered by easements, there are similar restrictions on housing densities (e.g. one residential unit per 30 acres). Within the town of Galena, a Kent County planner in 2008 identified the new phase of a subdivision with 100 lots. The county planner also identified several proposed rural subdivisions east of the nearby town of Fredericktown with 8 to 10 lots. Each of these Kent County residential developments is located in TSZ 1712.

A.4.3 Recent Commercial Development

The number of commercial projects that are recently completed or with construction underway in the US 301 study area has slowed between the October 2008 and December 2010 field survey. While, Middletown's rapidly growing population and its relative distance from Newark and Wilmington have encouraged new retailers, restaurants, medical services, and other professional service providers to expand into the market, regional job losses have tempered the growth. Many of the newly constructed commercial buildings in the project study area, which house multiple office or retail tenants, had one or more office suites or retail spaces empty during the field survey. These vacant suites or storefronts will certainly be occupied over time, but probably at a slower pace than initially anticipated by their developers. The narrative below describes recent and ongoing commercial development in the US 301 project study area during December 2010.

West of US 301 – New Castle County

Starting from the northern portion of this study subarea, in TSZ 217, a warehouse or hangar was under construction at Summit Airport. Further south, along US 301 at the northwest corner of its intersection with Churchtown Road (TSZ 313), two commercial buildings were recently completed. One building was approximately half occupied and the other had a single tenant and was mostly vacant. Further south, along US 301 and on the north side of TSZ 211, the Middletown Corporate Center, which is an office park with seven small one-story and two-story office buildings, is continuing to slowly fill with tenants. Further south in TSZ 211 and along US 301, a bank building and an auto parts store were constructed. Also in TSZ 211 and along Sandhill Drive, a new two-story office building and a building for a credit union were recently completed. The office building was vacant at the time of the field survey. Nearby, the southwest corner of US 301 and SH 15 has been an active area for new commercial construction during the past few years. Recently, a Walmart super center was built and is operating in TSZ 190. Additionally, a drug store was built nearby in the same TSZ. Along SH 15 (Bunker Hill Road) and also in TSZ 190, Bunker Hill Elementary School has recently completed and is opened to students.

East of US 301 and West of Route 1 – New Castle County

Starting at the north side of the study subarea, east of US 301 and west of Route 1, a four-story office building in TSZ 266 continues to add various private and non-profit tenants, in addition to the Appoquinimink Public Library and a community center that were located there during the previous field survey. The building's fourth floor appeared to be unoccupied. TSZ 212 has

been a very active area for commercial development in Middletown during the past few years. A Home Depot store was recently completed at the corner of US 301 and SH 299 (Main Street). On the north side of Main Street in TSZ 211, a fast food restaurant was also built. Further east along Main Street, another fast food restaurant was built in TSZ 307 and a large convenience store in TSZ 197. Along Noxontown Road and in TSZ 297, St. Andrew's School was building new facilities on its campus. A county park was also recently completed in TSZ 308, called Levels Road Park.

East of Route 1 – New Castle County

East of Route 1, no recent or ongoing commercial development was identified from the aerial photography or during the December 2010 field survey.

Cecil County

Existing commercial development in the study area portion of Cecil County centers on tourism in Chesapeake City, agriculture, horse farms, and plant nurseries, along with the supporting retailers and services for these industries and the population. No new commercial development was identified in the study area from the aerial photography or during the field survey.

Kent County, MD

Existing economic activity in this portion of Kent County, MD in the US 301 study area is similar to Cecil County, although with less emphasis on tourism. No recent commercial construction was identified from a review of aerial photography or during the field survey.

A.4.4 Future Commercial Development

A number of commercial projects are anticipated in and around the Town of Middletown, although the exact timing for many of these projects is not certain. As the regional economy stabilizes and as the residential and commercial real estate markets continue to underperform, these conditions will likely delay many of the proposed projects. The projects discussed in the narrative below were identified during December 2010 meetings with planners at the Town of Middletown and New Castle, Cecil, and Kent Counties.

The largest commercial project anticipated in the US 301 study area is a 460-bed hospital, which will be located on the east side of Middletown in TSZ 294. It is anticipated that this facility will employ between 1,500 and 2,000 workers. A rehabilitation center is also being planned in TSZ 197, which is expected to employ several hundred additional workers. Another proposed project, east of downtown, is a mixed-use development called the Promenade in TSZ 266. However, the developer has since abandoned the project, after starting the initial site preparation. The Peterson property, which is located along the north side of SH 299 and east of Silver Lake Road, is being proposed as a medium-density office and retail development. On the west side of Middletown, commercial development will continue to concentrate around the intersection of US 301 and SH 299, although no new construction was underway at the time of the field survey. In TSZ 212, the Middletown Auto Park, originally planned as a common location for automobile dealerships, will likely attract other retailers there instead. Further south in TSZ 212, the Westown commercial development has set aside large tracts (e.g. 50-acre parcels) for distribution and warehousing or industrial activity. Developers have also proposed hundreds of thousands of square feet of office, retail, and other commercial space will be built along US 301 in TSZ 190 and TSZ 267. One location, the Poole property, would have 240,000 square feet of office space, 90,000 square feet of retail space, and 90,000 square feet of warehouse space. Additional commercial development is also likely in TSZ 211, where there

has been a substantial amount of recent construction, primarily small professional offices, strip retail, and restaurants. Similarly, there are still vacant parcels along many of Middletown's arterials that would be desirable for commercial development, primarily for smaller free-standing retail or office buildings. Outside of Middletown, but within New Castle County, the Scott Run Business Park in TSZ 335 is being proposed as a very large commercial development. To date, no buildings have been built and probably will not be for several more years, at the earliest. Similarly, the Bayberry Town Center is proposed as a retail development in the southwest corner of TSZ 279 and the southeast corner of TSZ 314. There is also industrial zoned land east of Route 1 and south of the community of St. Georges in TSZ 282, but no signs of imminent or even contemplated activity.

In Cecil County, there is the possibility of commercial development in the aforementioned area south of Chesapeake City, but no specific plans were identified. There is no pending commercial development anticipated in the Kent County, MD portion of the study area. Future commercial activity could include the reactivation of the proposed mushroom farm and the development of solar farms.

A.5 Assessing and Adjusting the Population and Employment Forecasts

The socioeconomic data assessed for this study included WILMAPCO's 2011 forecasts for New Castle and Cecil Counties and data from DelDOT's 2010 Peninsula model for the remaining counties. The adjusted population and employment control totals used for this study anticipate reasonably modest growth for the 12-county study area through the forecast year of 2040 (See Tables 9, 10, and 11), while also accounting for a stabilization of the local economy in the near term. The baseline 2009 population control totals for each county in the model were adjusted to the U.S. Census Bureau's 2000-2010 Intercensal estimates population estimates for 2009, which took into account the results from the 2010 U.S. Census count. The 2010 population estimates were based upon the same U.S. Census data set. Baseline employment estimates for the counties were adjusted to the Delaware Department of Labor's and the Maryland Department of Labor, Licensing, and Regulation's QCEW data. Using these data led to a lower employment estimate than the 2010 DelDOT model's assumptions. While there are some shortcomings to the QCEW employment estimates, such as not counting agricultural workers and the self-employed, they also are more likely than other data sources to accurately reflect the number of individuals who commute to work.

Table A-9
Population Control Total Adjustments

CAROLINE COUNTY, MD

Year	2010 DelDOT Peninsula Model Population Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Population Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Population Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	33,650	--	33,699	--	33,013	--	-637	-686
2010	34,117	1.39%	34,100	0.79%	33,153	0.42%	-964	-947
2015	37,188	1.74%	37,250	1.19%	35,103	1.15%	-2,085	-2,147
2020	40,258	1.60%	40,299	1.78%	37,409	1.28%	-2,849	-2,890
2030	45,894	1.32%	46,000	1.59%	42,989	1.40%	-2,905	-3,011
2035	48,189	0.98%	48,972	1.26%	45,271	1.04%	-2,918	-3,701
2040	50,484	0.93%	52,136	1.26%	47,205	0.84%	-3,279	-4,931

CECIL COUNTY, MD

Year	2010 DelDOT Peninsula Model Population Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Population Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Population Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	102,082	--	102,448	--	100,818	--	-1,264	-1,630
2010	103,858	1.74%	103,847	1.37%	101,519	0.70%	-2,339	-2,328
2015	117,107	2.43%	117,796	2.55%	109,528	1.53%	-7,579	-8,268
2020	130,356	2.17%	130,350	2.05%	118,451	1.58%	-11,905	-11,899
2030	154,837	1.74%	155,000	1.65%	138,973	1.61%	-15,864	-16,027
2035	163,573	1.10%	168,217	1.65%	147,878	1.25%	-15,695	-20,339
2040	172,309	1.05%	182,560	1.65%	155,883	1.06%	-16,426	-26,677

DORCHESTER COUNTY, MD

Year	2010 DelDOT Peninsula Model Population Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Population Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Population Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	32,094	--	32,182	--	32,469	--	375	287
2010	32,304	0.65%	32,350	0.53%	32,668	0.61%	364	318
2015	34,242	1.17%	34,651	1.38%	33,829	0.70%	-413	-822
2020	36,180	1.11%	36,300	0.93%	35,027	0.70%	-1,153	-1,273
2030	38,713	0.68%	38,849	0.63%	37,709	0.74%	-1,004	-1,140
2035	39,681	0.50%	40,088	0.63%	39,008	0.68%	-673	-1,080
2040	40,648	0.48%	41,367	0.63%	40,151	0.58%	-497	-1,216

Table A-9 (Continued)
Population Control TotalsAdjustments

KENT COUNTY, DE

Year	2010 DelDOT Peninsula Model Population Forecast	CAGR	2009 US 301 ADJUSTED Population Forecast	CAGR	2011 US 301 ADJUSTED Population Forecast	CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	157,151	--	157,350	--	160,082	--	2,931	2,732
2010	159,657	1.60%	159,979	1.66%	163,314	2.02%	3,657	3,335
2015	169,069	1.15%	169,351	1.15%	174,812	1.37%	5,743	5,461
2020	178,481	1.09%	177,821	0.98%	184,371	1.07%	5,890	6,550
2030	192,194	0.74%	190,866	0.65%	198,286	0.73%	6,092	7,420
2035	198,263	0.62%	197,150	0.65%	204,401	0.61%	6,138	7,251
2040	204,331	0.60%	203,642	0.65%	210,611	0.60%	6,280	6,969

KENT COUNTY, MD

Year	2010 DelDOT Peninsula Model Population Forecast	CAGR	2009 US 301 ADJUSTED Population Forecast	CAGR	2011 US 301 ADJUSTED Population Forecast	CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	20,219	--	20,193	--	20,133	--	-86	-60
2010	20,364	0.72%	20,298	0.51%	20,226	0.46%	-138	-72
2015	21,280	0.88%	21,300	0.97%	20,764	0.53%	-516	-536
2020	22,197	0.85%	22,201	0.83%	21,481	0.68%	-716	-720
2030	23,307	0.49%	23,401	0.43%	22,691	0.55%	-616	-710
2035	23,668	0.31%	23,908	0.43%	23,228	0.47%	-440	-680
2040	24,029	0.30%	24,427	0.43%	23,580	0.30%	-449	-847

NEW CASTLE COUNTY, DE

Year	2010 DelDOT Peninsula Model Population Forecast	CAGR	2009 US 301 ADJUSTED Population Forecast	CAGR	2011 US 301 ADJUSTED Population Forecast	CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	532,036	--	532,343	--	533,697	--	1,661	1,354
2010	535,567	0.66%	534,416	0.39%	536,583	0.54%	1,016	2,167
2015	550,164	0.54%	547,632	0.49%	548,011	0.42%	-2,153	379
2020	564,761	0.53%	561,173	0.49%	559,679	0.42%	-5,082	-1,494
2030	586,348	0.38%	589,278	0.49%	581,432	0.38%	-4,916	-7,846
2035	595,091	0.30%	603,857	0.49%	591,124	0.33%	-3,967	-12,733
2040	603,834	0.29%	618,798	0.49%	598,896	0.26%	-4,938	-19,902

Table A-9 (Continued)
Population Control Total Adjustments

QUEEN ANNE'S COUNTY, MD

Year	2010 DelDOT Peninsula Model Population Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Population Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Population Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	47,500	--	47,950	--	47,530	--	30	-420
2010	48,238	1.55%	48,651	1.47%	47,996	0.98%	-242	-655
2015	52,001	1.51%	52,450	1.52%	51,732	1.51%	-269	-718
2020	55,764	1.41%	55,650	1.19%	55,481	1.41%	-283	-169
2030	61,340	0.96%	61,900	1.00%	61,042	0.96%	-298	-858
2035	63,640	0.74%	65,058	1.00%	63,335	0.74%	-305	-1,723
2040	65,940	0.71%	68,376	1.00%	65,617	0.71%	-323	-2,759

SOMERSET COUNTY, MD

Year	2010 DelDOT Peninsula Model Population Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Population Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Population Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	26,316	--	26,371	--	26,424	--	108	53
2010	26,474	0.60%	26,550	0.68%	26,516	0.35%	42	-34
2015	27,163	0.51%	27,501	0.71%	27,212	0.52%	49	-289
2020	27,851	0.50%	28,299	0.57%	28,023	0.59%	172	-276
2030	29,578	0.60%	29,350	0.28%	29,428	0.49%	-150	78
2035	29,874	0.20%	29,763	0.28%	29,723	0.20%	-151	-40
2040	30,170	0.20%	30,182	0.28%	30,021	0.20%	-149	-161

SUSSEX COUNTY, DE

Year	2010 DelDOT Peninsula Model Population Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Population Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Population Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	192,447	--	189,455	--	194,746	--	2,299	5,291
2010	196,554	2.13%	192,088	1.39%	198,285	1.82%	1,731	6,197
2015	215,704	1.88%	209,576	1.76%	217,958	1.91%	2,254	8,382
2020	234,854	1.72%	225,403	1.47%	237,601	1.74%	2,747	12,198
2030	270,997	1.44%	253,221	1.06%	274,652	1.46%	3,655	21,431
2035	289,187	1.31%	266,929	1.06%	293,260	1.32%	4,073	26,331
2040	307,377	1.23%	281,380	1.06%	311,894	1.24%	4,517	30,514

Table A-9 (Continued)
Population Control Total Adjustments

TALBOT COUNTY, MD

Year	2010 DelDOT Peninsula Model Population Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Population Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Population Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	36,491	--	36,693	--	37,495	--	1,004	802
2010	36,822	0.91%	36,951	0.69%	37,888	1.05%	1,066	937
2015	38,406	0.85%	38,550	0.85%	39,486	0.83%	1,080	936
2020	39,989	0.81%	40,050	0.77%	41,151	0.83%	1,162	1,101
2030	41,988	0.49%	42,098	0.41%	43,255	0.50%	1,267	1,157
2035	42,411	0.20%	42,968	0.41%	43,689	0.20%	1,278	721
2040	42,834	0.20%	43,856	0.41%	44,129	0.20%	1,295	273

WICOMICO COUNTY, MD

Year	2010 DelDOT Peninsula Model Population Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Population Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Population Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	94,996	--	95,256	--	98,071	--	3,075	2,815
2010	96,062	1.12%	96,099	0.88%	99,114	1.06%	3,052	3,015
2015	101,826	1.17%	101,847	1.17%	104,481	1.06%	2,655	2,634
2020	107,590	1.11%	107,450	1.08%	110,139	1.06%	2,549	2,689
2030	117,190	0.86%	117,549	0.85%	120,217	0.88%	3,027	2,668
2035	121,409	0.71%	122,630	0.85%	124,674	0.73%	3,265	2,044
2040	125,628	0.69%	127,932	0.85%	129,101	0.70%	3,473	1,169

WORCHESTER COUNTY, MD

Year	2010 DelDOT Peninsula Model Population Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Population Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Population Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	50,289	--	50,156	--	51,318	--	1,029	1,162
2010	50,736	0.89%	50,548	0.79%	51,584	0.52%	848	1,036
2015	53,573	1.09%	53,649	1.20%	53,148	0.60%	-425	-501
2020	56,411	1.04%	56,250	0.95%	55,091	0.72%	-1,320	-1,159
2030	60,132	0.64%	59,999	0.56%	58,254	0.56%	-1,878	-1,745
2035	61,485	0.45%	61,698	0.56%	59,665	0.48%	-1,820	-2,033
2040	62,838	0.44%	63,445	0.56%	61,080	0.47%	-1,758	-2,365

Table A-10
Total Number of Households Adjustments

CAROLINE COUNTY, MD

Year	2010 DelDOT Peninsula Model Household Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Household Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Household Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	12,868	--	12,633	--	12,140	--	-728	-493
2010	13,064	1.52%	12,783	1.19%	12,695	4.57%	-369	-88
2015	14,370	1.92%	13,963	1.78%	13,565	1.33%	-805	-398
2020	15,676	1.76%	15,107	1.59%	14,567	1.44%	-1,109	-540
2030	18,341	1.58%	17,246	1.26%	17,179	1.66%	-1,162	-67
2035	19,350	1.08%	18,360	1.26%	18,178	1.14%	-1,172	-182
2040	20,359	1.02%	19,546	1.26%	19,036	0.93%	-1,323	-510

CECIL COUNTY, MD

Year	2010 DelDOT Peninsula Model Household Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Household Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Household Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	37,979	--	37,892	--	36,766	--	-1,213	-1,126
2010	38,324	0.91%	38,412	1.38%	37,005	0.65%	-1,319	-1,407
2015	43,769	2.69%	43,578	2.56%	43,242	3.16%	-527	-336
2020	49,214	2.37%	48,248	2.06%	44,136	0.41%	-5,078	-4,112
2030	58,958	1.82%	57,437	1.67%	52,749	1.80%	-6,209	-4,688
2035	62,719	1.24%	62,396	1.67%	56,411	1.35%	-6,308	-5,985
2040	66,479	1.17%	67,783	1.67%	59,175	0.96%	-7,304	-8,608

DORCHESTER COUNTY, MD

Year	2010 DelDOT Peninsula Model Household Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Household Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Household Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	13,775	--	13,682	--	13,461	--	-314	-221
2010	13,886	0.81%	13,754	0.53%	14,042	4.32%	156	288
2015	14,928	1.46%	14,731	1.38%	14,748	0.99%	-180	17
2020	15,969	1.36%	15,433	0.94%	15,460	0.95%	-509	27
2030	17,087	0.68%	16,516	0.63%	16,645	0.74%	-442	129
2035	17,514	0.50%	17,043	0.63%	17,217	0.68%	-297	174
2040	17,941	0.48%	17,587	0.63%	17,721	0.58%	-220	134

Table A-10 (Continued)
Total Number of Households Adjustments

KENT COUNTY, DE

Year	2010 DelDOT Peninsula Model Household Forecast	CAGR	2009 US 301 ADJUSTED Household Forecast	CAGR	2011 US 301 ADJUSTED Household Forecast	CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	60,358	--	57,510	--	59,451	--	-907	1,941
2010	61,817	2.42%	58,428	1.61%	63,235	6.36%	1,418	4,807
2015	66,237	1.39%	61,654	1.08%	68,487	1.61%	2,250	6,833
2020	70,658	1.30%	64,461	0.89%	72,986	1.28%	2,328	8,525
2030	77,571	0.94%	68,355	0.51%	80,033	0.93%	2,462	11,678
2035	80,397	0.72%	70,116	0.51%	82,888	0.70%	2,491	12,772
2040	83,224	0.69%	71,922	0.51%	85,780	0.69%	2,556	13,858

KENT COUNTY, MD

Year	2010 DelDOT Peninsula Model Household Forecast	CAGR	2009 US 301 ADJUSTED Household Forecast	CAGR	2011 US 301 ADJUSTED Household Forecast	CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	8,246	--	8,623	--	8,139	--	-107	-484
2010	8,313	0.81%	8,669	0.52%	8,255	1.43%	-58	-414
2015	8,812	1.17%	9,102	0.98%	8,597	0.82%	-215	-505
2020	9,311	1.11%	9,488	0.83%	9,012	0.95%	-299	-476
2030	10,149	0.87%	10,005	0.45%	9,880	0.92%	-269	-125
2035	10,311	0.32%	10,232	0.45%	10,118	0.48%	-193	-114
2040	10,473	0.31%	10,464	0.45%	10,278	0.31%	-195	-186

NEW CASTLE COUNTY, DE

Year	2010 DelDOT Peninsula Model Household Forecast	CAGR	2009 US 301 ADJUSTED Household Forecast	CAGR	2011 US 301 ADJUSTED Household Forecast	CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	206,720	--	201,740	--	202,042	--	-4,678	302
2010	208,696	0.96%	202,442	0.35%	202,914	0.43%	-5,782	472
2015	217,923	0.87%	206,315	0.38%	207,032	0.40%	-10,891	717
2020	227,150	0.83%	210,745	0.43%	211,521	0.43%	-15,629	776
2030	242,308	0.65%	219,883	0.43%	219,444	0.37%	-22,864	-439
2035	247,344	0.41%	224,651	0.43%	222,899	0.31%	-24,445	-1,752
2040	252,381	0.40%	229,523	0.43%	225,725	0.25%	-26,656	-3,798

Table A-10 (Continued)
Total Number of Households Adjustments

QUEEN ANNE'S COUNTY, MD

Year	2010 DelDOT Peninsula Model Household Forecast	CAGR	2009 US 301 ADJUSTED Household Forecast	CAGR	2011 US 301 ADJUSTED Household Forecast	CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	18,291	--	18,030	--	17,916	--	-375	-114
2010	18,645	1.93%	18,306	1.53%	18,551	3.54%	-94	245
2015	20,370	1.79%	19,802	1.58%	20,264	1.78%	-106	462
2020	22,094	1.64%	21,093	1.27%	21,983	1.64%	-111	890
2030	25,850	1.58%	23,673	1.09%	25,725	1.58%	-125	2,052
2035	26,329	0.37%	24,992	1.09%	26,329	0.47%	0	1,337
2040	26,807	0.36%	26,384	1.09%	26,675	0.26%	-132	291

SOMERSET COUNTY, MD

Year	2010 DelDOT Peninsula Model Household Forecast	CAGR	2009 US 301 ADJUSTED Household Forecast	CAGR	2011 US 301 ADJUSTED Household Forecast	CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	8,827	--	9,123	--	8,773	--	-54	-350
2010	8,880	0.60%	9,185	0.68%	8,895	1.39%	15	-290
2015	9,280	0.88%	9,515	0.71%	9,296	0.89%	16	-219
2020	9,679	0.85%	9,789	0.57%	9,737	0.93%	58	-52
2030	10,066	0.39%	10,155	0.28%	10,015	0.28%	-51	-140
2035	10,167	0.20%	10,298	0.28%	10,167	0.30%	0	-131
2040	10,268	0.20%	10,443	0.28%	10,217	0.10%	-51	-226

SUSSEX COUNTY, DE

Year	2010 DelDOT Peninsula Model Household Forecast	CAGR	2009 US 301 ADJUSTED Household Forecast	CAGR	2011 US 301 ADJUSTED Household Forecast	CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	79,745	--	76,256	--	78,406	--	-1,339	2,150
2010	81,653	2.39%	77,312	1.37%	82,368	5.05%	715	5,056
2015	90,560	2.09%	84,292	1.74%	91,505	2.13%	945	7,213
2020	99,467	1.89%	90,575	1.45%	100,622	1.92%	1,155	10,047
2030	118,320	1.75%	101,535	1.04%	119,918	1.77%	1,598	18,383
2035	126,870	1.41%	106,926	1.04%	128,649	1.42%	1,779	21,723
2040	135,420	1.31%	112,603	1.04%	137,411	1.33%	1,991	24,808

Table A-10 (Continued)
Total Number of Households Adjustments

TALBOT COUNTY, MD

Year	2010 DelDOT Peninsula Model Household Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Household Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Household Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	16,142	--	15,874	--	16,036	--	-106	162
2010	16,338	1.21%	15,983	0.70%	16,811	4.83%	473	828
2015	16,991	0.79%	16,673	0.85%	17,469	0.77%	478	796
2020	17,645	0.76%	17,324	0.77%	18,158	0.78%	513	834
2030	18,880	0.68%	18,211	0.41%	19,450	0.69%	570	1,239
2035	19,144	0.28%	18,587	0.41%	19,722	0.28%	578	1,135
2040	19,409	0.27%	18,972	0.41%	19,994	0.27%	585	1,022

WICOMICO COUNTY, MD

Year	2010 DelDOT Peninsula Model Household Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Household Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Household Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	36,874	--	36,526	--	36,969	--	95	443
2010	37,398	1.42%	36,846	0.87%	38,586	4.37%	1,188	1,740
2015	40,203	1.46%	39,037	1.16%	41,252	1.35%	1,049	2,215
2020	43,008	1.36%	41,164	1.07%	44,028	1.31%	1,020	2,864
2030	47,419	0.98%	44,986	0.84%	48,644	1.00%	1,225	3,658
2035	49,316	0.79%	46,907	0.84%	50,638	0.81%	1,322	3,731
2040	51,212	0.76%	48,911	0.84%	52,640	0.78%	1,428	3,729

WORCHESTER COUNTY, MD

Year	2010 DelDOT Peninsula Model Household Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Household Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Household Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	22,009	--	22,522	--	22,167	--	158	-355
2010	22,254	1.11%	22,699	0.79%	22,628	2.08%	374	-71
2015	23,659	1.23%	24,097	1.20%	23,473	0.74%	-186	-624
2020	25,063	1.16%	25,267	0.95%	24,480	0.84%	-583	-787
2030	27,194	0.82%	26,952	0.56%	26,349	0.74%	-845	-603
2035	28,077	0.64%	27,715	0.56%	27,250	0.67%	-827	-465
2040	28,960	0.62%	28,500	0.56%	28,156	0.66%	-804	-344

Table A-11
Employment Control Total Adjustments

CAROLINE COUNTY, MD

Year	2010 DelDOT Peninsula Model Employment Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Employment Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Employment Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	13,907	--	8,782	--	8,567	--	-5,340	-215
2010	14,100	1.39%	8,707	-0.84%	8,474	-1.09%	-5,626	-233
2015	14,876	1.08%	9,511	1.78%	8,728	0.59%	-6,148	-783
2020	15,651	1.02%	10,291	1.59%	9,138	0.92%	-6,513	-1,153
2030	16,434	0.49%	11,747	1.26%	9,797	0.70%	-6,637	-1,950
2035	16,516	0.10%	12,506	1.26%	10,044	0.50%	-6,472	-2,462
2040	16,598	0.10%	13,314	1.26%	10,298	0.50%	-6,300	-3,016

CECIL COUNTY, MD

Year	2010 DelDOT Peninsula Model Employment Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Employment Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Employment Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	38,306	--	30,246	--	30,249	--	-8,057	3
2010	39,008	1.83%	29,990	-0.84%	27,988	-7.47%	-11,020	-2,002
2015	47,354	3.95%	34,020	2.55%	29,015	0.72%	-18,339	-5,005
2020	55,700	3.30%	37,649	2.05%	32,546	2.32%	-23,154	-5,103
2030	60,300	0.80%	44,766	1.65%	39,854	2.05%	-20,446	-4,912
2035	61,000	0.23%	48,583	1.65%	43,367	1.70%	-17,633	-5,216
2040	61,700	0.23%	52,726	1.65%	46,071	1.22%	-15,629	-6,655

DORCHESTER COUNTY, MD

Year	2010 DelDOT Peninsula Model Employment Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Employment Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Employment Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	16,490	--	11,563	--	11,187	--	-5,303	-376
2010	16,530	0.24%	11,466	-0.84%	11,271	0.75%	-5,259	-195
2015	17,356	0.98%	12,280	1.38%	11,526	0.45%	-5,830	-754
2020	18,183	0.93%	12,866	0.94%	12,036	0.87%	-6,147	-830
2030	19,456	0.68%	13,770	0.63%	12,881	0.68%	-6,575	-889
2035	19,670	0.22%	14,209	0.63%	13,102	0.34%	-6,568	-1,107
2040	19,884	0.22%	14,663	0.63%	13,319	0.33%	-6,565	-1,344

Table A-11 (Continued)
Employment Control Total Adjustments

KENT COUNTY, DE

Year	2010 DelDOT Peninsula Model Employment Forecast	CAGR	2009 US 301 ADJUSTED Employment Forecast	CAGR	2011 US 301 ADJUSTED Employment Forecast	CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	64,037	--	61,986	--	60,260	--	-3,777	-1,726
2010	65,158	1.75%	61,383	-0.97%	60,077	-0.30%	-5,081	-1,306
2015	67,605	0.74%	64,911	1.12%	61,606	0.50%	-5,999	-3,305
2020	70,052	0.71%	68,140	0.98%	64,607	0.96%	-5,445	-3,533
2030	73,179	0.44%	73,150	0.66%	69,738	0.77%	-3,441	-3,412
2035	75,431	0.61%	75,596	0.66%	71,860	0.60%	-3,571	-3,736
2040	77,682	0.59%	78,124	0.66%	73,965	0.58%	-3,717	-4,159

KENT COUNTY, MD

Year	2010 DelDOT Peninsula Model Employment Forecast	CAGR	2009 US 301 ADJUSTED Employment Forecast	CAGR	2011 US 301 ADJUSTED Employment Forecast	CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	12,798	--	8,455	--	7,907	--	-4,891	-548
2010	12,905	0.84%	8,383	-0.84%	7,645	-3.31%	-5,260	-738
2015	13,680	1.17%	8,797	0.97%	7,871	0.58%	-5,809	-926
2020	14,454	1.11%	9,167	0.83%	8,243	0.93%	-6,211	-924
2030	15,466	0.68%	9,665	0.43%	8,872	0.74%	-6,594	-793
2035	15,504	0.05%	9,875	0.43%	9,095	0.50%	-6,409	-780
2040	15,543	0.05%	10,089	0.43%	9,325	0.50%	-6,218	-764

NEW CASTLE COUNTY, DE

Year	2010 DelDOT Peninsula Model Employment Forecast	CAGR	2009 US 301 ADJUSTED Employment Forecast	CAGR	2011 US 301 ADJUSTED Employment Forecast	CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	283,540	--	276,205	--	266,171	--	-17,369	-10,034
2010	283,489	-0.02%	272,741	-1.24%	262,250	-1.47%	-21,239	-10,491
2015	299,778	1.12%	276,757	0.29%	264,600	0.18%	-35,178	-12,157
2020	298,599	-0.08%	280,788	0.29%	269,383	0.36%	-29,216	-11,405
2030	295,706	-0.10%	289,067	0.29%	275,333	0.22%	-20,373	-13,734
2035	295,590	-0.01%	293,283	0.29%	277,284	0.14%	-18,306	-15,999
2040	296,582	0.07%	297,560	0.29%	279,228	0.14%	-17,354	-18,332

Table A-11 (Continued)
Employment Control Total Adjustments

QUEEN ANNE'S COUNTY, MD

Year	2010 DelDOT Peninsula Model Employment Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Employment Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Employment Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	22,379	--	14,068	--	13,379	--	-9,000	-689
2010	22,727	1.55%	13,951	-0.84%	13,202	-1.32%	-9,525	-749
2015	25,340	2.20%	15,039	1.51%	13,650	0.67%	-11,690	-1,389
2020	27,954	1.98%	15,956	1.19%	15,124	2.07%	-12,830	-832
2030	29,631	0.58%	17,747	1.00%	18,184	1.86%	-11,447	437
2035	29,927	0.20%	18,652	1.00%	19,518	1.43%	-10,409	866
2040	30,224	0.20%	19,604	1.00%	20,882	1.36%	-9,342	1,278

SOMERSET COUNTY, MD

Year	2010 DelDOT Peninsula Model Employment Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Employment Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Employment Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	11,338	--	6,994	--	6,854	--	-4,484	-140
2010	11,406	0.60%	6,935	-0.84%	6,683	-2.49%	-4,723	-252
2015	12,300	1.52%	7,184	0.71%	6,914	0.68%	-5,386	-270
2020	13,193	1.41%	7,392	0.57%	7,363	1.27%	-5,830	-29
2030	13,879	0.51%	7,666	0.27%	8,062	0.91%	-5,817	396
2035	14,052	0.25%	7,770	0.27%	8,241	0.44%	-5,811	471
2040	14,226	0.25%	7,876	0.27%	8,419	0.43%	-5,807	543

SUSSEX COUNTY, DE

Year	2010 DelDOT Peninsula Model Employment Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Employment Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Employment Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	76,482	--	69,481	--	68,627	--	-7,855	-854
2010	77,107	0.82%	68,806	-0.97%	69,223	0.87%	-7,884	417
2015	81,838	1.20%	74,964	1.73%	72,140	0.83%	-9,698	-2,824
2020	86,570	1.13%	80,590	1.46%	76,724	1.24%	-9,846	-3,866
2030	94,290	0.86%	90,565	1.07%	84,135	0.93%	-10,155	-6,430
2035	98,150	0.81%	95,515	1.07%	87,121	0.70%	-11,029	-8,394
2040	102,010	0.77%	100,736	1.07%	90,130	0.68%	-11,880	-10,606

Table A-11 (Continued)
Employment Control Total Adjustments

TALBOT COUNTY, MD

Year	2010 DelDOT Peninsula Model Employment Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Employment Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Employment Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	28,698	--	19,119	--	18,192	--	-10,506	-927
2010	29,061	1.27%	18,959	-0.84%	17,761	-2.37%	-11,300	-1,198
2015	30,224	0.79%	19,779	0.85%	18,309	0.61%	-11,915	-1,470
2020	31,386	0.76%	20,548	0.77%	19,073	0.82%	-12,313	-1,475
2030	32,328	0.30%	21,601	0.41%	20,229	0.59%	-12,099	-1,372
2035	32,490	0.10%	22,047	0.41%	20,636	0.40%	-11,854	-1,411
2040	32,651	0.10%	22,503	0.41%	21,043	0.39%	-11,608	-1,460

WICOMICO COUNTY, MD

Year	2010 DelDOT Peninsula Model Employment Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Employment Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Employment Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	59,226	--	46,118	--	44,620	--	-14,606	-1,498
2010	59,947	1.22%	45,729	-0.84%	43,701	-2.06%	-16,246	-2,028
2015	62,945	0.98%	48,465	1.17%	45,069	0.62%	-17,876	-3,396
2020	65,942	0.93%	51,132	1.08%	48,219	1.36%	-17,723	-2,913
2030	69,499	0.53%	55,935	0.84%	52,578	0.87%	-16,921	-3,357
2035	70,059	0.16%	58,324	0.84%	53,667	0.41%	-16,392	-4,657
2040	70,619	0.16%	60,815	0.84%	54,778	0.41%	-15,841	-6,037

WORCHESTER COUNTY, MD

Year	2010 DelDOT Peninsula Model Employment Forecast	2010 DelDOT Peninsula Model CAGR	2009 US 301 ADJUSTED Employment Forecast	2009 US 301 ADJUSTED CAGR	2011 US 301 ADJUSTED Employment Forecast	2011 US 301 ADJUSTED CAGR	2010 DelDOT-2011 US 301 Total Change	2009 US 301-2011 US 301 Total Change
2009	34,037	--	23,956	--	23,210	--	-10,827	-746
2010	34,272	0.69%	23,675	-1.19%	22,950	-1.12%	-11,322	-725
2015	35,986	0.98%	25,131	1.20%	23,543	0.51%	-12,443	-1,588
2020	37,700	0.93%	26,350	0.95%	25,311	1.46%	-12,389	-1,039
2030	39,208	0.39%	28,106	0.56%	27,082	0.68%	-12,126	-1,024
2035	39,490	0.14%	28,902	0.56%	27,372	0.21%	-12,118	-1,530
2040	39,772	0.14%	29,720	0.56%	27,662	0.21%	-12,110	-2,058

A.5.1 Assessment and Adjustment at the TSZ level

The existing population and employment forecasts for each TSZ in the U.S. 301 project study area were assessed and adjustments were made based upon a review of various data sources including: windshield surveys, interviews with local planning agencies, digital aerial photography, inventories of platted projects, maps, plans, and other relevant literature. Interviews were conducted with the staff of planning offices in New Castle County, Cecil County, Kent County (Maryland), the Town of Middletown, and WILMAPCO.

A.5.2 Employment by Sector

The assignment of employment by sector was not changed for the 2009 baseline figures or for any of the forecast periods, except for the TSZs within the US 301 project study area. Outside of that exception, in instances where a TSZ's total forecasted employment was adjusted, the employment by sector was adjusted proportionately to the changes made to the TSZ's total employment forecast.

A.5.3 Median Household Income

It was judged that WILMAPCO's median household income estimates and the DelDOT 2010 Peninsula Transportation Model's median household income estimates did not adequately account for recent national trends, under which household incomes have declined. The median household income value for all TSZs was reduced by 2.0 percent between 2009 and 2010. The values were further reduced by 0.5 percent for each year between 2010 and 2015. All zonal median household income values were then maintained at the 2015 level for all future forecast periods.

A.5.4 Households

The 2010 estimate of households for each county was adjusted to its respective 2010 U.S. Census based figure. At the zonal level, the assessment used an estimate of persons per household, which was based upon the figures assumed by the DelDOT 2010 Peninsula model for all counties but New Castle County and Cecil County. In New Castle County, due to discrepancies within the agency's data, the 2010 persons per household value was used to produce all future estimates of households by zone. In Cecil County, the WILMAPCO estimates of person per household for each forecast period were judged to be reasonable.

A.5.5 Adjustments to Forecasts Outside of the Study Area

The assessment and adjustments to the population and employment forecasts of TSZs outside of the project area occurred during the adjustments to the county population and employment control totals. All adjustments were weighted according to the difference between forecast periods. The population and employment forecasts for individual TSZs outside of the study area were not reviewed for reasonableness nor were further adjustments made.

A.6 Conclusions

The 12 counties within the DelDOT 2010 Peninsula Transportation Model are currently experiencing modest population growth and stabilizing employment levels after the effects of the most recent national recession. In terms of total population and employment, the 12 counties are dominated by New Castle County but from a broader perspective, the area's growth patterns are also influenced by changes in the Philadelphia, Pennsylvania, Washington, D.C. and Baltimore, Maryland metropolitan areas. The intense downward pressure from the national economy has impacted population and employment growth patterns at the local level but these pressures are diminishing somewhat as the national economy improves. During the past few years, the region (primarily New Castle County) has experienced significant job losses from large employers, such as the closure of the Chrysler automobile manufacturing plant in Newark, Delaware and the culling of jobs in the financial sector. As the nation continues its slow emergence from the global financial crisis, its and the region's recovery will be modest and it will likely require a number of years before economic activity approaches earlier rates of growth. Undeniably, the United States has entered into a new period of slower economic growth. Collectively, ongoing problems in the financial sector, government debt and problems with governance, along with fluctuations in fuel costs, will affect the spatial allocation of land development, since consumers have become reliant upon easy access to credit and fuel to create and sustain cheap housing and sprawling development patterns. However, population growth in the US 301 study area will continue, although at more modest rates than during the recent past. The overall level of employment within the US 301 study area has likely increased during the past few years with the opening of various retail stores and is expected to grow further with the construction of new medical facilities that will provide a significant increase to the study area's future employment. Both trends should contribute to growing traffic volumes on the proposed US 301 roadway.

The US 301 Project Team has prepared the following responses to issues raised by FHWA, during their review of the Draft US 301 Mainline Toll Road Report, dated November 4, 2011.

Each of FHWA's comments is provided below, along with our responses.

Comment 1 - *The upgraded US 301 corridor is intended to compete with the I-95 corridor on cost and time. The majority of truck travel is non-local. Note the reported asymmetry in route choice between SB & NB truck travel (23%) due to tolls on NB I-95 in MD. This supports the cost-competitive pricing strategy for the US 301 corridor.*

Response: The US 301 Project Team concurs that the I-95 corridor and the US 301 corridor do compete to some extent particularly for long-haul movements. The toll plan assumed for US 301 is similar in structure to the I-95 Newark Toll Plaza and coupled with the improved travel times on the US 301 Mainline Toll Road, it is anticipated that the new toll road will attract a small percentage of vehicles from the existing long-haul movements that currently utilize I-95, which is a conservative assumption with respect to revenue estimation for the US 301 Mainline Toll Road.

Comment 2 - *The majority of passenger car travel in the corridor is within the MD-DE area. Many travelers will have access to routing assistance (GPS, smart phones). It's better to argue that the alternative, non-tolled local routes aren't time competitive.*

Response: The US 301 Project Team concurs that many of the travelers currently using the US 301 corridor will have access to GPS and Smart Phone Technology that will provide information for non-tolled alternatives. Stantec, the Department's subconsultant who has generated the project's Traffic and Revenue forecasts, indicated that the toll diversion model does estimate that approximately 70 percent of local travelers moving between locations within 20 miles on either side of the Maryland-Delaware state line will not utilize the toll road. For less-frequent, longer-distance travelers, it is less likely that they will explore these non-tolled alternative routes given the additional time required to divert around the mainline plaza. Note that the toll diversion model was calibrated to replicate the same choice issue for long-distance trips that could utilize localized bypass routes around the existing Newark Toll Plaza on I-95.

Comment 3 - *It's not clear how the external trip purposes identified in the intercept survey were used in the diversion model for VOT. The report only discusses segmentation by payment type.*

Response: For these relatively long-distance travelers, Stantec assumed that these trips were predominately non-home-based trips as opposed to home-based work (HBW) or home-based other (HBO) trips. This assumption resulted in the use of a value of time of $11.32 per hour, which is reasonable for these infrequent trips.

Comment 4 - *The procedures used to adjust the 12-county DelDOT regional model were reasonably clear. Not so for the longer distance travel which accounts for most of the toll revenue. The trip table development discussion in Chapter 4 relies heavily on judgment for the external trips, with a reduced but relatively high compound growth rate of 1.3%. How does this compare to the socio-economic forecasts for the primary County/State external ODs in VA/PA/NJ/NY?*

Response: Stantec has reviewed the population and employment trends for the regions contributing the external trip markets and compared the compounded annual growth rates with the annual growth rate of the Chesapeake Bay Bridge. The growth in population and employment over the last decade has generally been approximately 0.6% per year. Traffic on the Chesapeake Bay Bridge has been averaging 2.0 percent per year between 2000 and 2010 which does include the impacts of the on-going recession and significant increases in fuel prices. This ratio is roughly 3 to 1 (2.0/0.6)

For the horizon year forecasts, Stantec assumed a relatively flat growth of 0.5 per year from 2009 to 2015, and then assumed 1.5% for the remainder of the forecast period which results in a compounded rate of 1.3%. Over that same period, MWCOG expects population to increase at approximately 0.9% annually and the Philadelphia, Northern New Jersey region, and the NYMTC region are assumed to growth approximately 0.5 percent per year by their respective MPO's. Using the lowest population growth rate from all of these regions, the implied ratio (1.3/0.5) is consistent with the recent historical trends.

Comment 5 - *The calibration discussion (page 40) mentions "FHWA standards" with no reference. The percentages discussed are consistent validation guidelines driven largely by criteria for scoping capacity additions. Acceptance criteria for model accuracy should be derived from the decision-support requirements.*

Response: Stantec calibrated the regional model highway assignment in methods consistent with recent FHWA guidance (FHWA's Validation and Reasonableness Checking Manual). Stantec calibrated the toll diversion model to available primary paypoints within the DelDOT Regional Model. This calibration was focused primarily on replicating observed usage at the I-95 Newark plaza by vehicle type and payment method, and to a lesser extent the SR 1 Dover and Biddles Mainline Plazas. The observed and estimated statistics at these paypoints is provided at the bottom of Table 4-6 as part of the screenline summary analysis.

Comment 6 - *Page 57: Reducing the median household income for 2010-2015 and capping household income at 2015 levels is a reasonably conservative approach, though the net impact on the forecast is not clear given that the diversion model relies on VOT by trip purpose.*

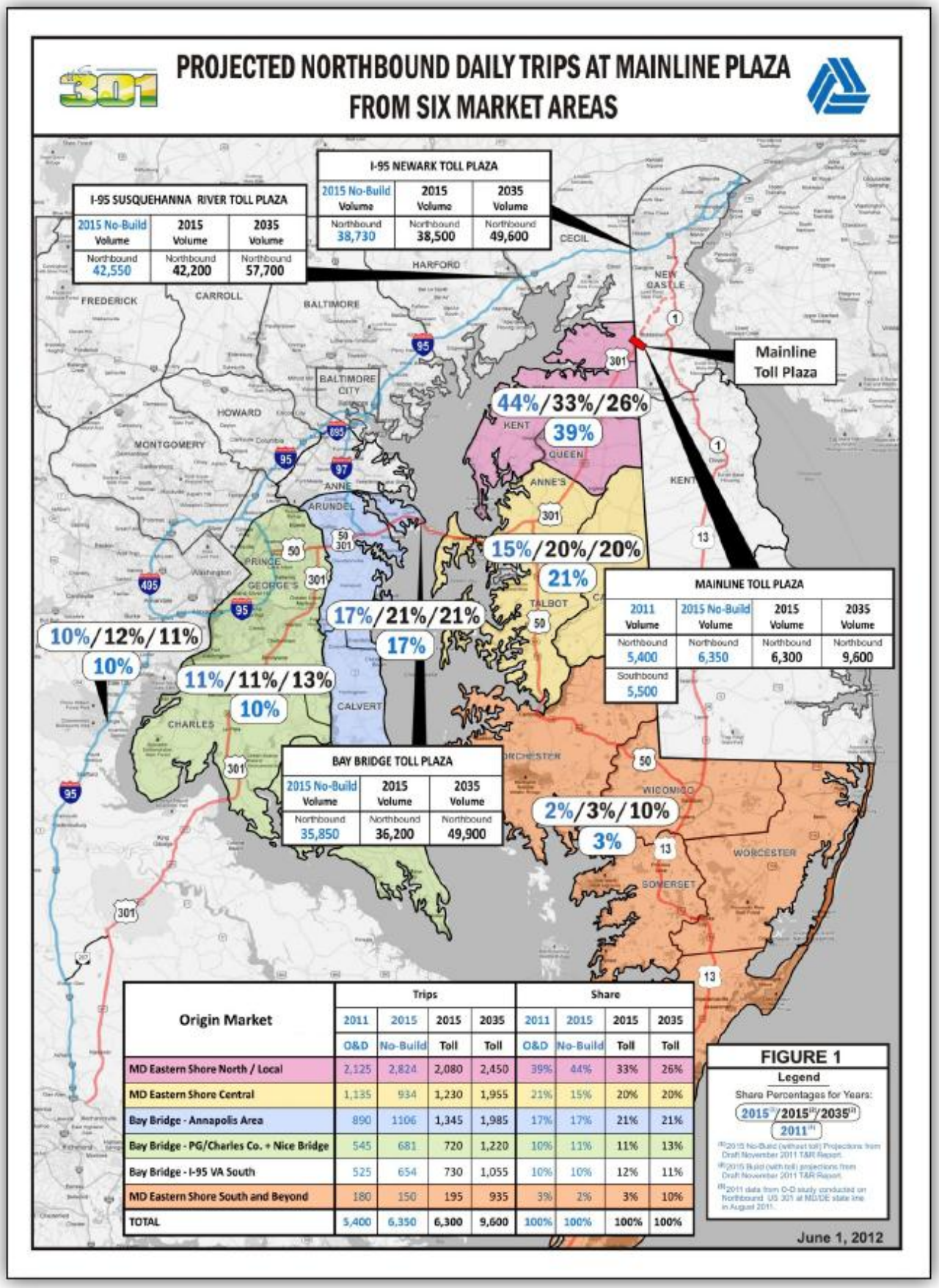
Response: - Stantec elected to keep the median household constant in order to provide a conservative estimate of future trip generation, since the DelDOT regional model utilizes the household income level to estimate overall trip making. As households increase their wealth, auto ownership tends to increase and more trips are made. By holding the incomes constant in the regional model, fewer trips are produced which is conservative for the purposes of revenue estimation.

For purposes of toll diversion, Stantec did assume that household incomes would basically keep pace with inflation. For the US 301 Mainline Toll Road, toll rates are increased over time at 5-year intervals resulting in a compounded rate of 2.7% over the forecast period. During this same period, household incomes are increased at a lower rate of 2.4%, derived from historical trends, indicating that the travelers' income will generally keep pace with the increased tolls, but will lag slightly over the full length of the forecast period.

Comment 7 – *Last, given the economic condition changes, you may want to take another look on how toll will impact development within the corridor inside the State.*

Response: - As part of this investment-grade study, Stantec retained a subconsultant to provide an independent assessment of the demographic data and forecasts for the horizon years. The existing and planned development was analyzed at the parcel level for major developments and forecasted growth rates were adjusted as necessary to reflect the current economic conditions. The planned developments, including several larger generators, appear to be locating in the corridor to take advantage of on-going network improvements, including the potential US 301 toll road. Since the US 301 project has been well publicized over the last 5 years as a future toll facility, it is assumed that the proposed development plans recognize that this facility will be constructed as a toll road.

Figure B-1
Origin of Northbound Trips on US 301 at the MD/DE State Line



Origin Market	Trips				Share			
	2011 O&D	2015 No-Build	2015 Toll	2035 Toll	2011 O&D	2015 No-Build	2015 Toll	2035 Toll
MD Eastern Shore North / Local	2,125	2,824	2,080	2,450	39%	44%	33%	26%
MD Eastern Shore Central	1,135	934	1,230	1,955	21%	15%	20%	20%
Bay Bridge - Annapolis Area	890	1106	1,345	1,985	17%	17%	21%	21%
Bay Bridge - PG/Charles Co. + Nice Bridge	545	681	720	1,220	10%	11%	11%	13%
Bay Bridge - I-95 VA South	525	654	730	1,055	10%	10%	12%	11%
MD Eastern Shore South and Beyond	180	150	195	935	3%	2%	3%	10%
TOTAL	5,400	6,350	6,300	9,600	100%	100%	100%	100%

[1] 2015 No-Build (without toll) Projections from Draft November 2011 T&R Report.
[2] 2015 Build (with toll) projections from Draft November 2011 T&R Report.
[3] 2011 data from O-D study conducted on Northbound US 301 at MD/DE state line in August 2011.

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